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TYRED AND EMOTIONAL!

THE age-old adage, by which many abide, is that there is no need to reinvent the wheel.

However, Goodyear is intent on reinventing the tyre. The latest fruit of its labour is a concept tyre that it believes will one day outlive the life of the car it is fitted to!

Developed in partnership with the Citroën oli concept car project, the Eagle GO concept tyre is made of nearly all sustainable materials. They include sunflower oils, pine tree resins, natural rubber and rice husk ash silica.

As part of Goodyear's goal to deliver data- and sensor-enabled intelligence in all new products by 2027, the Eagle GO concept includes a sensor that monitors a variety of tyre health parameters.

If the prospect of a tyre that can achieve up to 500,000 km (310,000 miles) in its lifetime is exciting for the automotive sphere, then imagine the potential ramifications for motorsport. At Le Mans this season, for instance, more than 2,500 tyres were used across practice, qualifying and the race by the LMP2 category alone. It makes you wonder…

Of course, the need to maintain performance – both in terms of lap times and longevity – is paramount in motorsport. But increasingly, there is an awareness that we are involved in a race not just against the stopwatch, but to beat climate change.

To that end, the awkward environmental questions that were for a long time shrugged off by some companies – 'don't worry, our tyres are recycled in a cement factory' can only take you so far – are now being addressed through increased research and investment.

One of our cover features this month offers a fascinating insight from Cyrille Roget, technical and scientific communication director for the Michelin Group, one of Goodyear's rivals. He assesses some of the challenges faced by the industry and reveals the steps being taken to address them. It's well worth a read. If you are one of those who dismisses tyres as black, round and boring, you might like to think again.

For a typical road car, for instance, the CO2 incurred by the rolling resistance of the tyre during its usage phase is by far the biggest factor. In motorsport, however, lifecycle analysis suggests that the usage phase is no longer the biggest impact. Instead, it's the materials.

Which is one of the reasons why the fast-moving laboratory that is motorsport, can play a pivotal role in achieving the tyre companies' Holy Grail: tyres made 100% of bio-sourced, renewable or recycled materials.

It's another glimpse of why 'Race to Road', the theme of this year's RACE TECH World Motorsport Symposium, is not just a cliché; it's genuinely important.

Mark Skewis
EDITOR

ALPINE CAPTURES SPIRIT OF "HYDROGEN REVOLUTION"

This is what the motorsport of tomorrow needs to look like, says French brand. By **Mark Skewis**

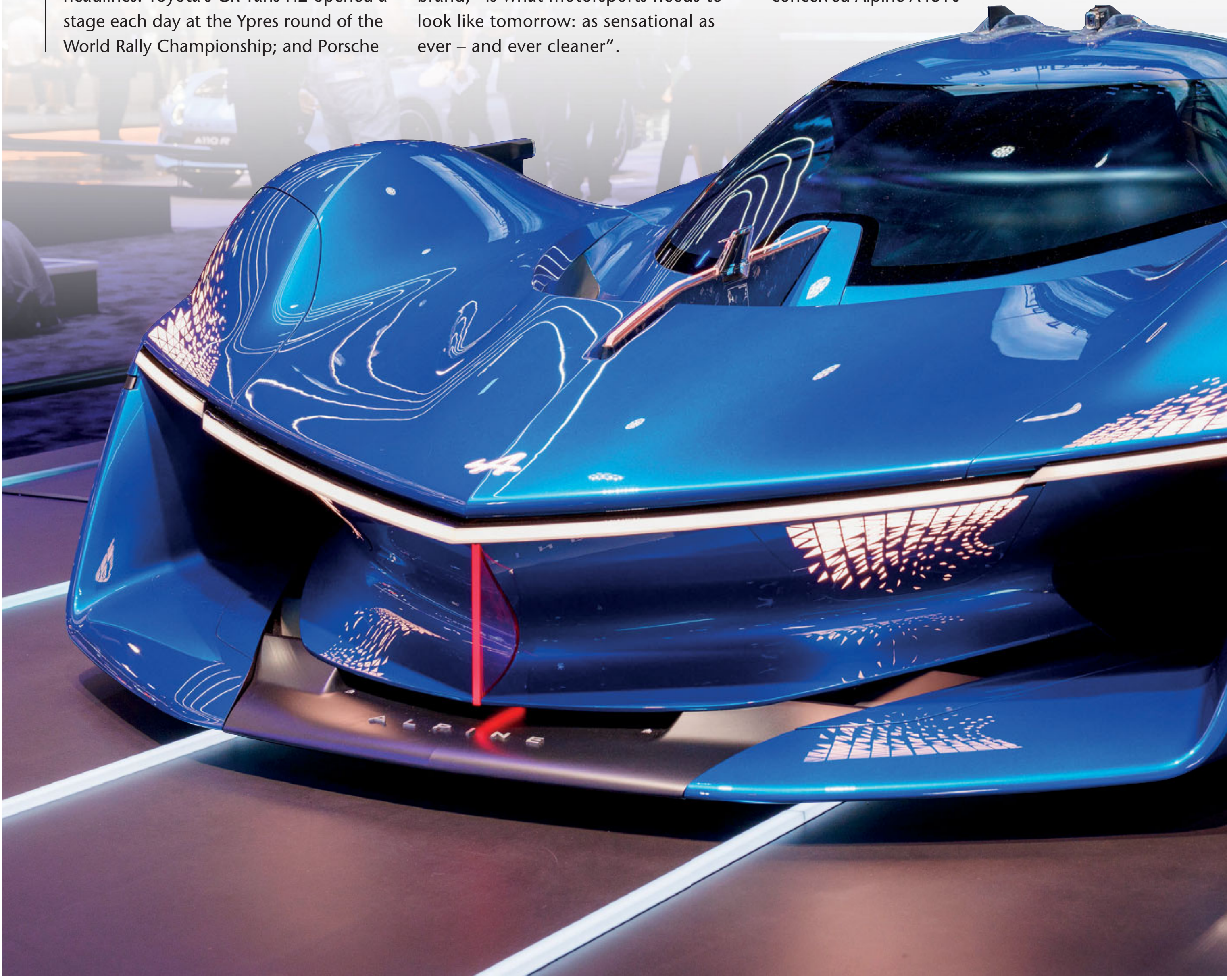
ALPINE has become the latest motorsport powerhouse to showcase hydrogen technology that could safeguard the future of the Internal Combustion Engine.

In recent weeks two notable hydrogen combustion projects have grabbed the headlines: Toyota's GR Yaris H2 opened a stage each day at the Ypres round of the World Rally Championship; and Porsche Engineering mastered the Nürburgring Nordschleife with hydrogen – in the digital world.

Now, Alpine has revealed a hydrogen-powered supercar, reminiscent of an LMP sportscar prototype, at the Paris Motor Show. The concept, says the brand, "is what motorsports needs to look like tomorrow: as sensational as ever – and ever cleaner".

The dramatically styled new Alpine Alpenglow concept – a single-seat design in which the driver sits between two 700-bar hydrogen tanks – serves to preview the French sporting company's upcoming road and race cars.

The Alpenglow, like the similarly conceived Alpine A4810



concept designed by students at Turin's Istituto Europeo di Design earlier this year, is fuelled by hydrogen – only this time the brand has confirmed it uses an electrically assisted internal combustion engine, rather than a fuel cell arrangement.

"Alpine is really the technological spearhead of the group," said Christian Stein, VP Brands Communications at Groupe Renault, at the car's unveiling in Paris. "Alpenglow is a completely disruptive concept car. It is Alpine's futuristic vision of automotive excellence.

"With its hydrogen-powered clean combustion hybrid engine, Alpenglow takes us into the future of sustainable motorsport. Further ahead in time, it may also serve as an inspiration for standard production vehicles. Why not?"

Alpenglow is, says Alpine, "more than a concept car: it is a brand manifesto."

Motorsport, in which the brand competes in Formula 1 and the World Endurance Championship, is said to have been the compass throughout Alpenglow's creation.

ALPINE
H2
ALPINE
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ABOVE The car builds on the brand's heritage but at the same time is firmly focused on the future

LEFT The spectacular Alpenglow was launched at the Paris Motor Show

The Alpenglow is, Alpine reports, as lightweight as the rest of the brand's cars. The bodywork features extensive use of recycled carbon fibre. The driver sits on the centre line of the car, between two cylindrical tanks.

The concept's defining design cues, its dramatic front light bar and vertical stacked tail-lights, will be a feature of its future production cars, as will a variation of its LMP1-inspired steering wheel. Aerodynamic efficiency will be a crucial tenet of Alpine's future design language. Here it is manifested in a sharp, V-shaped front end, huge air channels down the side, a roofline that sits just one metre off the ground and an active, lightweight rear wing, in this instance completely transparent.

To develop this technology, Alpine is leveraging expertise from the Renault Group entities that have built a full ecosystem revolving around hydrogen, which includes HYVIA. The latter is a joint venture between Renault Group and Plug Power Inc, a leading hydrogen and fuel cell solutions provider. HYVIA is led by David Holderbach, who has two decades of experience at the Renault Group.

Last July the BWT Alpine F1 Team and HYVIA announced plans to enter into a partnership to invest together in state-of-the-art technologies and the transition to sustainable mobility.

Alpenglow is Alpine's first step on the path ▶

ABOVE Alpine is leveraging expertise from the Renault Group for its concept car

> “Alpenglow is a completely disruptive concept car that takes us into the future of sustainable motorsport”

to sustainable solutions for clean mobility. The intention is to combine carbon-neutral systems, tapping into the natural complementarity between vehicles running on an electric battery (BEVs), vehicles running on a fuel cell (FCEVs) and vehicles with hybrid internal-combustion engines using a sustainable fuel – possibly green hydrogen.

In the shorter term, Alpine’s next generation of models – its Dream Garage – will comprise three exclusive all-electric models: a compact sports car (B segment), a GT crossover (C segment) and a A110 replacement.

Hydrogen F1 study

Alpine revealed recently that it is evaluating whether hydrogen could be a potential source of power for the Formula 1 cars of the future.

The study intends to address the issue of whether hydrogen power could deliver the necessary performance levels F1 requires. If so, a Garage 56 entry at the Le Mans 24 Hours could be one option available to showcase the technology.

“We are investigating hydrogen as a fuel because I believe manufacturers, and especially PU manufacturers, have the duty to shape regulations and to bring solutions to the table,” said Alpine CEO Laurent Rossi

“To me, and to us, it’s kind of like a good way to kill a lot of birds with one stone. It’s cleaner, for sure. It’s not fully clean, granted, but it’s much more improved compared to traditional fuel.

“It’s abundant, that’s for sure, whereas organic or synthetic fuel can be limited in terms of supply and or cost of producing.

“Plus, it preserves one thing, which is the noise. Okay perhaps in like 20 years people will forget about that, because the new generations couldn’t care less and they’ll be used to cars being silent in the street, but at the moment, this is what makes that show as well.

“We must not forget that F1 is a sport, i.e. entertainment. It’s a business for sure. But that business is built on people loving it and watching it and enjoying it. I can’t not think about that. So we are pursuing that path.” RT

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BELOW Alpine is evaluating whether hydrogen could be the answer for future F1 rulesets

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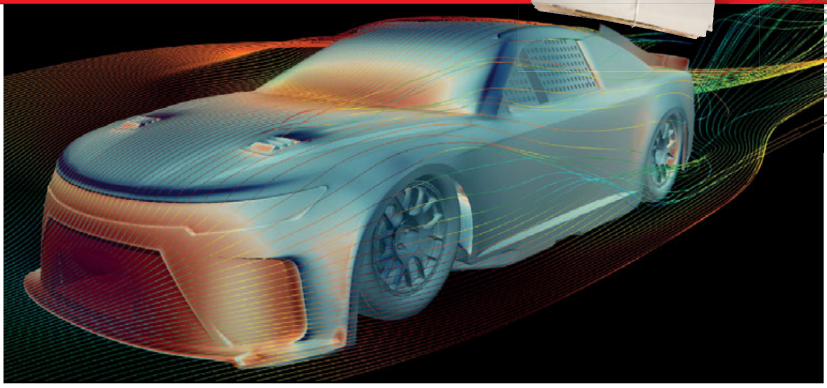

Why WMS 2022 can play a key role in the pursuit of sustainability

ABOVE The architect of NASCAR's Next Gen aero revolution is among the speakers confirmed for WMS '22

FORMULA 1 Chief Technical Officer Pat Symonds believes this year's RACE TECH World Motorsport Symposium has the power to play a big role in furthering motorsport safety and sustainability.

Titled 'Sustainable Motorsport 2030 – Race to Road', WMS 2022 will be hosted at The Embassy of Switzerland in the United Kingdom on Thursday December 1 and Friday December 2.

"Racing is the fast track to the adoption of advanced technologies on the road but the path from race to road is only open if knowledge is shared," said Symonds. "The World Motorsport Symposium provides the ideal forum for open discussion and the dissemination of that knowledge.

"This ensures that technologies that can contribute to subjects such as safety and sustainability become more accessible."

Dubbed 'The Davos of Motorsport', the WMS has carved itself a unique position as the annual international cabinet meeting that leads the conversation in motorsport and automotive technology. This year's event will retain its popular 'Chatham House' rules format, which enables debate without fear of being quoted in public.

The WMS returns this year following a two-year hiatus caused by the global COVID pandemic.

Symonds will join former Audi engine guru Ulrich Baretzky as co-chairman. Former Formula 1 and World Rally Championship-winning aerodynamicist John Iley, a co-chairman since the event's inception, will return this year in the role of the 'Speaker'.

"We need someone of John's calibre and wide range of knowledge to help keep the Cabinet members under control!" said Soheila Kimberley, Publishing Director of the Kimberley Media Group. "Seriously, I am delighted, and humbled, that John has agreed to be involved again. Without his massive contribution throughout the years, there wouldn't be a World Motorsport Symposium.

"With John, Ulrich and Pat at the helm, we have a formidable team to help explore the many serious issues that face the sport as it plots its sustainable future. Together, I think we can deliver what I am sure will be a fantastic event."

Eric Jacuzzi, Managing Director, Aerodynamics/Vehicle Performance at NASCAR, the man behind the Next Gen NASCAR's aero development, was the latest heavy-hitter to confirm his participation as this magazine went to press. RT

FIA launches global talent search

FIA President Mohammed Ben Sulayem has announced the creation of the first ever FIA motorsport engineering scholarship at Cranfield University. This is a unique global talent search initiative which provides a pathway for a talented young engineer from one of the FIA regions to obtain a Master's in Advanced Motorsport Engineering.

Diversifying and enriching the motorsport engineering scene is part of the FIA's Equality, Diversity and Inclusion (EDI) commitments. The FIA's Member Clubs in 146 countries and their local academic partners have an opportunity to have their students participate in the selection process for the scholarship, which will cover both cost of tuition and living expenses in the UK.

Cranfield has undertaken research, consultancy and testing for the motorsport sector since the 1970s. It has a diverse staff and student community with people from over 100 countries studying and working at the University. Cranfield is also home to the FIA approved Cranfield Impact Centre and AXSIM which work with F1 and leading motorsport companies. It is regarded as one of the top alma maters for the best motorsport engineers.

The candidates will undergo standard Cranfield selection process and FIA will award the scholarship to the one which best fits its EDI commitments.

Applications are open from 15th October 2022 to 15th February 2023 here: https://www.cranfield.ac.uk/courses/taught/advanced-motorsport-engineering

FIA President, Mohammed Ben Sulayem, said: "I passionately believe that the sport should be open to anyone who has a desire to learn and participate. This scholarship will allow a young person facing financial challenges the opportunity to study motorsport engineering at the world's leading university in the field and to bring that knowledge back to their country and community."

Professor of Automotive Engineering, James Brighton, said: "At the highest levels of motorsport there are still barriers to entry for the brightest engineers, with fierce competition for roles. Engineers need to have a passion for the sport, exceptional technical knowledge, and the ability to work in a fast paced, high-pressure environment.

"This scholarship will allow a student that typically would not be able to join us the chance to study in the UK, on our leading postgraduate programme. Through our relationships with the industry combined with their desire, we will build the attributes, skills and network needed to start their motorsport career." RT

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Ferrari unveils first works Le Mans car for 50 years

ABOVE The 499P's livery is a nod to the 312P of the 1970s

FIFTY years after Ferrari's last works exploits in elite endurance racing, the launch of Maranello's new Le Mans Hypercar (LMH) has been described as "a dream come true" by Antonello Coletta, Head of Ferrari Attività Sportive GT.

"We wanted to pay homage to our history, with many references, both large and small, to a past made up of successes and titles," Coletta said of the 499P. "We do so however, looking ahead, creating a manifesto of our commitment to the world endurance championship. The 499P is a prototype that is decidedly Ferrari, in the fullest sense of the term."

The Prancing Horse was lured back to endurance racing by the convergence of the Automobile Club de l'Ouest and IMSA on a new set of regulations. While IMSA's GTP/LMDh category is based on the spine of the new LMP2 cars, with a standard hybrid unit, the ACO's rules permit teams to develop their own hybrid powertrain.

"We chose this moment because after many years, the rules have changed," explained Coletta. "We sat at the table from the first day of the new discussion with the FIA, ACO and IMSA. And we realized that Ferrari had the chance to create 100 percent of the car with a lesser budget than the past.

"We chose LMH because for Ferrari, it's important to make all the car and all these parts. Ferrari is a constructor, manufacturer of the cars, and our philosophy is to create the cars. This is a manifesto of the technologies of Ferrari, and for this matter, we need to create 100 percent of the cars."

The 499P's hybrid powertrain combines a mid-rear power unit with an electric motor powering the front axle. The internal combustion engine (ICE) has a maximum regulation-limited output to the wheels of 500 kW (680 CV) and is derived from the road-going twin-turbo V6 family. The ICE, which shares the architecture of the engine fitted to the 296 GT3, has undergone a thorough overhaul by Ferrari's engineers, aimed both at developing ad hoc solutions for the prototype and lightening the overall weight.

The second element of the hybrid powertrain is the Energy Recovery System, with a maximum power output of 200 kW (272 CV). The electric motor is equipped with a differential and is driven by a battery that is recharged during deceleration and braking, requiring no external power source.

The battery pack, with a nominal voltage of 900v, benefits from experience honed in Formula 1 – where aerospace and defence expert SAFT, a subsidiary of TotalEnergies, was employed – although it was purpose-built for this project. Among the specific characteristics of the 499P's V6 is the fact that the engine is load-bearing and therefore performs a valuable structural function, compared to the versions fitted to competition GT cars, where the engine is mounted onto the car's rear sub-chassis. The powertrain is coupled to a seven-speed sequential gearbox.

The design of the 499P's aerodynamics was refined with the support of the Ferrari Styling Centre under the direction of Flavio Manzoni. The tail is characterised by a double horizontal wing. The lower wing features a distinctive 'light bar'.

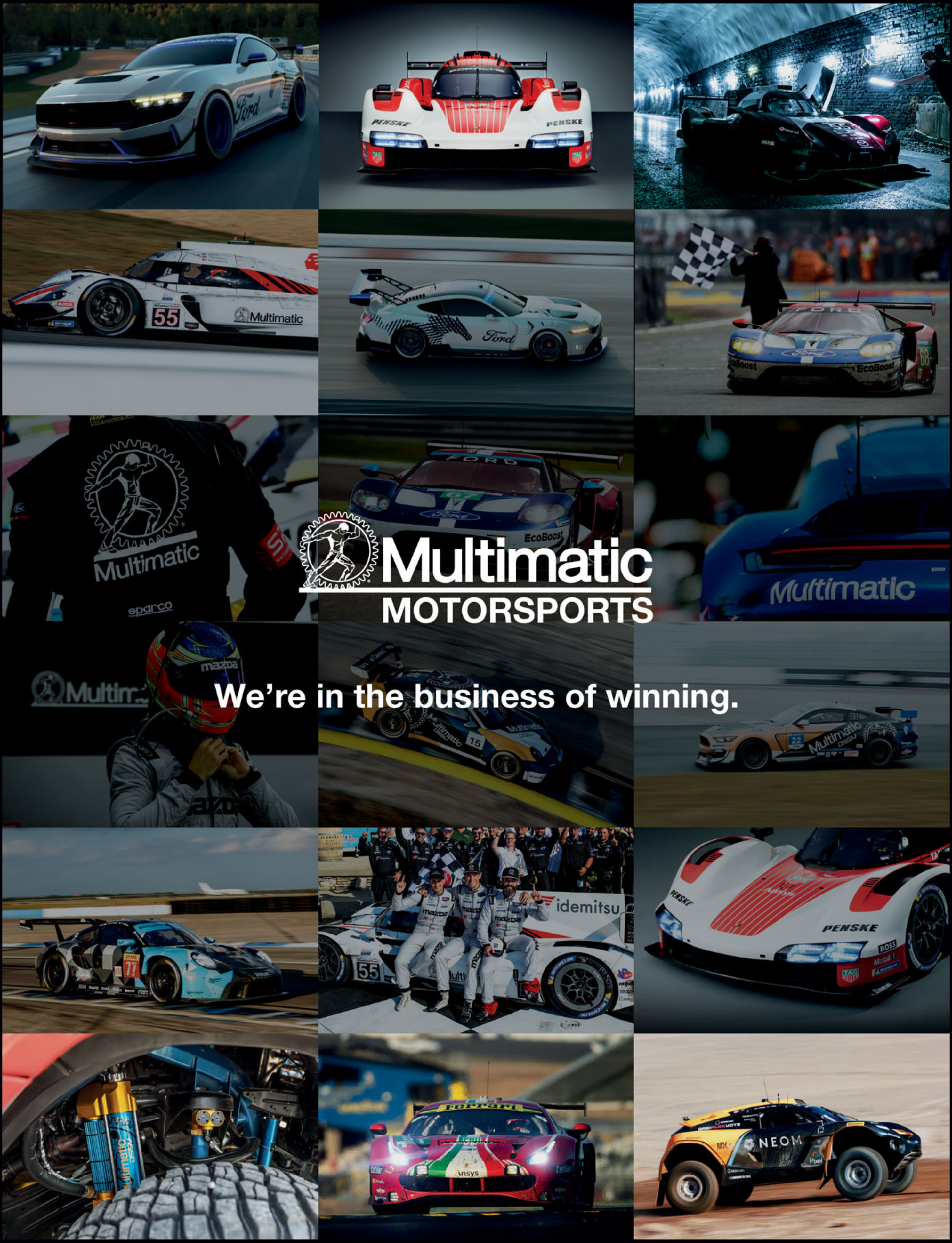
The car is designed with double wishbone, push-rod-type suspension.

The Ferrari 499P will be managed on track by AF Corse, continuing a winning partnership which dates back to the 2006 FIA GT championship.

John Elkann, Ferrari Executive Chairman, said: "When we decided to commit to this project, we embarked on a path of innovation and development, faithful to our tradition that sees the track as the ideal terrain to push the boundaries of cutting-edge technological solutions, solutions that in time will be transferred to our road cars.

"We enter this challenge with humility, but conscious of a history that has taken us to over 20 world endurance titles and nine overall victories at the 24 Hours of Le Mans."

The car will make its competition debut at the 1000 Miles of Sebring, the opening race of the 2023 FIA World Endurance Championship, in March. RT



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ABOVE The all-electric series delivered record-breaking global TV audiences for a second consecutive season

Is Formula E emerging as a mainstream sport for the next generation?

THE ABB FIA Formula E World Championship has grown its cumulative audience for Season 8 beyond the record-breaking levels achieved the previous season. A four-way battle for the championship, a new qualifying format and a return to racing in Asia contributed to the new highs.

Among a series of broadcast presentation and sporting enhancements introduced for Season 8, a new qualifying format saw all 22 drivers compete in two groups with the top four in each going into a head-to-head knockout ‘Duels’ tournament. A first for world motorsport and a popular innovation for fans, the cumulative audience for qualifying increased 49% compared to audiences for the traditional fastest-lap format in Season 7.

The biggest-ever ABB FIA Formula E World Championship calendar of 16 races in 10 world cities included a return to Asia with successful debuts in Jakarta, Indonesia, and a double-header in Seoul, South Korea, to close Season 8. The Jakarta race in June was the first Formula E race in Asia since 2019 and was the most-watched domestic race in the championship’s 100-race history with a cumulative audience of 27.6m in Indonesia.

Live viewers made up the majority of Formula E’s audience for the first time in Season 7 and that trend continued in Season 8 with a 10% increase in live audiences YOY to 216m, part of a 20% growth in total cumulative audience to 381m.

The combination of enhanced scheduling consistency and improved coverage of more competitive racing contributed to significant increases in audience engagement. Total viewing hours for Season 8 races increased by 58% compared to Season 7 and the championship enjoyed a 28% YOY increase in the average viewing duration per live race.

Across Formula E’s social and digital channels there were significant gains in video views (+165% vs Season 7) and engagements (up 49%) as a refreshed social media content strategy came into effect.

“The ABB FIA Formula E World Championship is building a passionate global fanbase, establishing itself as an appointment-to-view, premium live sport,” said Jamie Reigle, Chief Executive Officer, Formula E. “Millions more fans tuned in to watch last season than ever before thanks to consistent scheduling, improved broadcast presentation and sporting innovations like our game-changing qualifying format that we have put in place in close collaboration with the FIA.

“We thank our global network of committed broadcast partners for their contribution to delivering a record-breaking Season 8. We will work together to build on our momentum and reinforce Formula E’s emergence as a mainstream sport for the next generation.”

The new Gen3 car, the fastest, lightest, most powerful and efficient electric race car ever built, will debut on 14 January 2023 in Mexico City at the start of Season 9. RT

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Sauber

Sauber to be Audi's F1 team

SAUBER is to become Audi's works Formula 1 team from 2026.

The deal has been one of the sport's worst-kept secrets since August, when the German manufacturer announced that it will join F1 as a power unit supplier. Its entry will coincide with new regulations that feature increased electrification and 100% sustainable fuels.

Sauber – which is currently running under the Alfa Romeo – will become Audi's "strategic partner" for the F1 programme, with Audi acquiring a stake in the Sauber Group.

Audi's new partner has more than 30 years of competitive experience, ranging from the World Sportscar Championship to Formula 1. Sauber also boasts world renowned facilities. Its high-tech wind tunnel in Hinwil (Switzerland), just under four hours away by car, was used both by Audi and its sister company, Porsche, to develop their hugely successful endurance racing cars. Audi also used the tunnel for the development of its Class 1 touring car, which went on to dominate the DTM.

While the F1 power unit will be created at Audi's Motorsport Competence Center in Neuburg an der Donau, Sauber will develop and manufacture the racecar at Hinwil. Sauber will also be responsible for planning and executing the race operations.

"We are delighted to have gained such an experienced and competent partner for our ambitious Formula 1 project," said Oliver Hoffmann, Member of the Board for Technical Development at Audi AG. "We already know the Sauber Group with its state-of-the-art facility and experienced team from previous collaborations and are convinced that together we will form a strong team."

"Audi is the best partner for the Sauber Group," said Finn Rausing, Chairman of Sauber Holding. "It is clear that both companies share the same values and vision. We are looking forward to achieving our common goals with a strong and successful partnership."

Development of the power unit, which consists of an electric motor, battery, control systems and a combustion engine, is already in full swing at the facility of the specially founded Audi Formula Racing GmbH in Neuburg an der Donau. More than 120 employees are already working on the project.

"Sauber is a first-class partner for the use of the Audi Power Unit," said Adam Baker, managing director of the company. "We are looking forward to working with an experienced team that has helped shape many eras of Formula 1 history. Together, we want to write the next chapter starting in 2026."

Frédéric Vasseur, Sauber Motorsport CEO & Team Principal, said: "The partnership between Audi AG and Sauber Motorsport is a key step for our team as we continue to make progress towards the front of the grid. To become Audi's official works team is not only an honour and a great responsibility: it's the best option for the future and we are fully confident we can help Audi achieve the objectives they have set for their journey in Formula One."

Neuburg expansion

The timetable up to the first race with Audi participation in the 2026 season is ambitious: the expansion of the Neuburg facility in terms of personnel, buildings and technical infrastructure should be largely in place in 2023. The first tests with the power unit developed for the 2026 regulations in a Formula 1 test car are planned for 2025.

Formula 1 is taking a big step towards sustainability with the new regulations that will come into effect from 2026. This was an important prerequisite for Audi to decide to enter the championship. The power units will be more efficient than they are today, as the proportion of electric power will increase significantly. The electric drivetrain will then have nearly as much power as the internal combustion engine, which comes to 400 kW (544 hp).

The highly efficient 1.6-litre turbocharged engines will also be powered by sustainable synthetic fuel that is CO2-neutral (according to EU standards).

Formula 1 has also set itself the goal of being CO2-neutral as a racing series by 2030. RT

ABOVE Sauber possesses one of Europe's leading wind tunnels and world-class motorsport manufacturing facilities

RIGHT Audi is to acquire a stake in the Sauber Group

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Multimatic wins MIA Business of the Year accolade

MULTIMATIC has won the prestigious MIA Business of the Year (with sales over £5 million) Award.

Revealed during the Motorsport Industry Association's Business Excellence Awards dinner, held at Silverstone, the award recognises Multimatic's achievements in engineering, manufacturing and motorsports operations.

Multimatic Motorsports is celebrating 30 years of on-track success in 2022. For three decades, the company has designed and built championship-winning race cars for both factory and customer programmes. Multimatic also boasts its own world-class professional race teams and ran the successful Ford GT World Endurance Championship campaign from its UK Motorsports base.

The company's Special Vehicle Operations group is the chassis manufacturer for the new Porsche 963, which will race for the first time at the Rolex 24 at Daytona in 2023.

Larry Holt, VP Multimatic Special Vehicle Operations, said: "It is a real honour to be recognised by the MIA in this way in the world's leading motorsports country. This award belongs to all of our employees who work on the wide range of technologies and products that we supply to the motorsports industry."

Other winners included: Jenvey Dynamics (Business of the Year with annual sales under £5m); McLaren Applied (The Technology & Innovation Award); Zircotec (Export Achievement Award); Lifeline Fire & Safety Systems (New Markets Award); the British Motorsports Marshals Club (Teamwork Award); and Silverstone Park (Service to the Industry Award).

BELOW Larry Holt, VP Multimatic Special Vehicle Operations, accepts the award from James Setter, Head of High Performance Automotive, Xtrac

Formula E to race in Tokyo

JAPAN is set to host a round of the ABB FIA Formula E World Championship in 2024.

The Tokyo Metropolitan Government and Formula E have signed a Memorandum of Understanding (MOU) with the objective of bringing a race to the area around Tokyo Big Sight, the largest international exhibition centre in Japan.

The Tokyo Metropolitan Government has been working to promote the use of ZEV (Zero Emission Vehicles) to realise "Zero Emission Tokyo" – an environmentally advanced city that emits no CO2 – and Formula E will work with the city to promote the ZEV strategy.

"Tokyo is an iconic world city, recognised as an innovator in consumer technology, a leader in the automotive industry and a global cultural trendsetter," said Jamie Reigle, CEO, Formula E. "Formula E is delighted to partner with Tokyo Metropolitan Government to establish the city as a reference in zero emissions initiatives."

The planned schedule for next season currently features 18 races between January and July 2023 on street circuits in 13 world cities, beating the previous record of 16 races in 10 different cities this season to be Formula E's biggest and boldest campaign yet.

LEFT A Formula E race will support the Zero Emission Tokyo commitment

New Gen3 Mustang revealed at Bathurst

ABOVE The all-new Ford Mustang GT Gen3 Supercar

FORD has revealed the first race-prepared seventh-generation Mustang, with the 2023 Mustang GT 'Gen3' Supercar uncovered at Mount Panorama ahead of the famous Bathurst 1000.

The Mustang will race the Chevrolet Camaro when the Gen3 era commences next March.

"It is fantastic to be able to show, for the very first time globally, the seventh-generation Mustang in racing form," said Mark Rushbrook, Global Director, Ford Performance Motorsports. "The reveal of the Mustang Supercar is the first of many, with Mustang to race in GT3, GT4, NASCAR and NHRA competition globally.

"Mustang has been an iconic brand on and off the track for 58 years and its legend will continue around the world. We always say Mustang was born to race, and that is more true today than ever. The Mustang GT Supercar is ready to race in 2023."

The Mustang Supercar has been built by Ford's homologation team Dick Johnson Racing, in conjunction with Ford Performance, in preparation for the 2023 season when a new era of Supercars racing begins.

Like the Camaro, the Gen3 Mustang Supercar closely resembles its road-going counterpart, with production-based Coyote V8 engine, low roofline and long hood.

Ford supported teams in 2023, which will race the new Mustang, include Dick Johnson Racing, Tickford Racing, Grove Racing, Blanchard Racing Team and new to the Mustang stable, Walkinshaw Andretti United.

"This car looks sensational, it's loud, it's fast and we can't wait to see it hit the track," said Andrew Birkic, president and CEO, Ford Australia and New Zealand.

The seventh-generation Ford Mustang will hit Australian roads in late 2023.

Nissan Z GT4 unveiled

CONTINUING the story and legend of the fabled sports car, Nissan Motor Co Ltd and Nissan Motorsports & Customizing Co Ltd (NMC) have revealed the Nissan Z GT4, based on the all-new Nissan Z.

GT4-spec racing machines are based on production vehicles, modified for competition use. To that end, NMC's NISMO Racing Division took the street version of the new Z – which is receiving acclaim around the world – and tuned the VR30DDTT engine, optimized its chassis and suspension, enhanced its aerodynamics to the limit of regulations and created a cockpit that works for drivers of all types.

"Motorsports for Nissan is an expression of our passion and unrivalled expertise. The Nissan Z continues to maintain its position as an exciting sports car that fascinates drivers with its driving dynamics and flexible powertrain," said Nissan COO Ashwani Gupta. "We are confident that this track-ready GT4-category Nissan Z will be ready to write another chapter in the Nissan Z's 50-plus-year legacy of speed."

The Nissan Z GT4 was developed at NISMO's engineering facilities, at multiple track-test sessions and also as a test-entry vehicle which participated in the Fuji 24 Hour Race in June, as well as additional Super Taikyu Series events at Motegi and more.

Vehicle deliveries will begin in the first half of 2023.

BELOW The new Nissan/NISMO Nissan Z GT4 will be ready for the track in 2023

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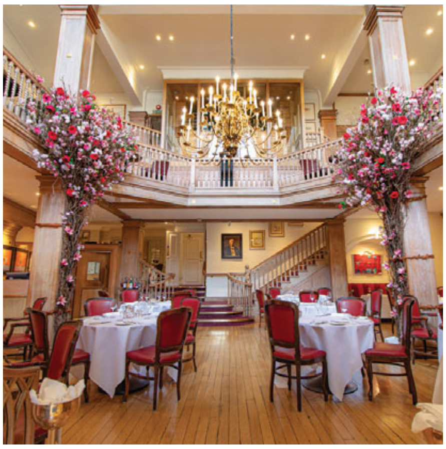

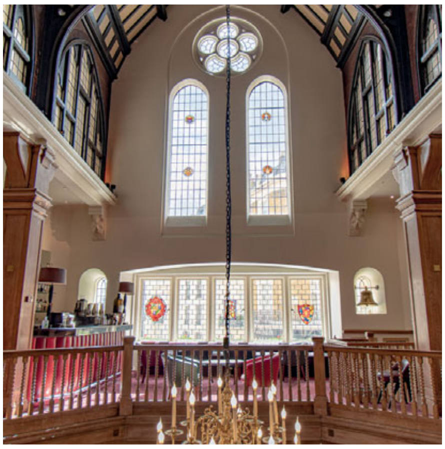

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RACE TECH's Editor Mark Skewis and his panel of industry experts are looking for ground-breaking motorsport technology that enables a positive impact on the environment. If you believe that your product should be considered, **apply by 7th November 2022** with a short brief to sara.kimberley@kimberleymediagroup.com. A member of the team will then contact you for further information.

Nominees and winners will be announced at the World Motorsport Symposium Champagne Drinks Reception and Networking Awards Dinner on the evening of Tuesday 1st December 2022 at the Mosimann's Club in the heart of Belgravia, in front of key influential leaders in the motorsport and automotive industry.

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- Racecar Aerodynamicist
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PROGRAMME

DAY ONE: Thursday, 1st December 2022

- 9.00 – 9.10

Opening and Welcome by RACE TECH Magazine

Soheila Kimberley, Publishing Director

Adrian Goodsell, Managing Director

- 9.10 – 9.20

Welcome by Markus Leitner

Ambassador of Switzerland, FDFA

- 9.20 – 9.30

Welcome to the World Motorsport Symposium by the Chairmen

Ulrich Baretzky, Former Director Audi Motorsport Engine Development, Audi AG

Pat Symonds, Formula 1 Chief Technical Officer

- 9.30 – 9.45

Presentation and Q&A by John Cooper

Director General at FuelsEurope & Concawe

Sustainable fuels

- 9.45 – 10.30

Panel session: ***Sustainable fuels***

- 10.30 – 11.00 **COFFEE BREAK**

- 11.00 – 11.10

Presentation by Professor David Greenwood

CEO, WMG High Value Manufacturing Catapult, Director for Industrial Engagement, WMG the University of Warwick

Battery Tech

- 11.10 – 11.25

Presentation by Thomas Laudenbach

Head of Porsche Motorsport

- 11.25 – 12.15

Panel session: ***Electrical and battery tech***

- 12.15 – 13.45 **LUNCH BREAK**

- 13.45 – 14.00

Presentation by Romain Aubry

Motorsport Technical Manager, TotalEnergies

Hydrogen and Sustainable fuels

- 14.00 – 14.15

Presentation by Bernard Niclot, Technical Director at the FIA & Head of Hydrogen project at ACO & **Thierry Bouvet**, Technical Director, ACO

ACO's sustainable and hydrogen strategy in motorsport, FIA

- 14.15 – 15.00

Panel session: ***Alternative energy***

- 15.00 – 15.20

Presentation by Dr Lea Schwarz, AUDI

Motorsport in a changing world *– facing sustainability and road relevance*

- 15.20 – 16.05

Panel session: ***The future direction of sustainable race to road technology***

- 16.05 – 16.35 **COFFEE BREAK**

- 16.35 – 16.50

Presentation by Jason Somerville

Head of Aerodynamics, FIA

F1 2022 – from Targets to Track – *after the clean sheet rewrite of the aerodynamic regulations in order to improve the racing, Jason Somerville reviews how it went and what's coming next*

- 16.50 – 17.05

Presentation by Dr Eric Jacuzzi

Managing Director, Aerodynamics/Vehicle Performance, R&D Center, NASCAR

The Next Gen NASCAR

- 17.05 – 17.50

Panel session: ***The future of aerodynamics***

- 17.50 – 18.00

Resume of the day

Wrap-up from **Ulrich Baretzky & Pat Symonds** on conclusions from both morning and afternoon sessions

DAY TWO: Friday 2nd December 2022

- 9.00 – 9.05

Opening and Welcome by RACE TECH Magazine

Soheila Kimberley, Publishing Director

Adrian Goodsell, Managing Director

- 9.05 – 9.15

Welcome to day two of the World Motorsport Symposium by the Chairmen

Ulrich Baretzky, Former Director Audi Motorsport Engine Development, Audi AG

Pat Symonds, Formula 1 Chief Technical Officer

- 9.15 – 9.25

Presentation by Larry Holt

Executive Vice President, Multimatic Special Vehicle Operations Group, Multimatic Engineering

- 9.25 – 9.35

Presentation by Dr Julien Gillard

Head of TGR Simulation UK, Toyota

Sustainability through Simulation

- 9.35 – 10.05 **COFFEE BREAK**

- 10.05 – 10.25

Presentation by Aramco

- 10.25 – 10.40

Presentation by Dr Wolfgang Warnecke

Adviser Carbon Management, Shell Germany

Hydrogen in the future?

- 10.40 – 11.15

Panel session: *Hydrogen in the future?*

- 11.15 – 11.25

Presentation by Jean-Francois Weber

Managing Director, Head of R&D, GreenGT

Hydrogen fuel cell technology

- 11.25 – 12.15

Panel session: *Hydrogen fuel cell technology*

- 12.15 – 12.30

TECH TALK by Ruaraidh McDonald-Walker

Technical Director, McLaren Applied

What is next for electrified motorsport?

- 12.30 – 14.00 **LUNCH BREAK**

- 14.00 – 14.15

Presentation by Mark Preston

Founding Team Principal of DS TECHEETAH Formula E

- 14.15-14.30

Presentation by Cyrille Roget

Scientific and Innovation Expert, Michelin

Sustainability in tyres

- 14.30 – 15.15

Panel session: *Sustainable vehicle components*

- 15.15 – 15.25

Presentation by Stephane Bazire

Head of Business Sustainability & Partnerships at Silverstone Circuit

Are spectators really keen on sustainability in motorsport?

- 15.25 – 16.00 **COFFEE BREAK**

- 16.00– 16.10

Presentation by Ellen Jones

Head of Sustainability, Formula 1

How do the governing bodies in motorsport encourage the attempt for sustainability?

- 16.10– 16.45

Panel session: *The future of sustainable motorsport events*

- 16.45– 17.00

Resume of the two days

Wrap-up from **Ulrich Baretzky & Pat Symonds** on conclusions from both morning and afternoon sessions

NB. The programme is subject to change

LEADING THE QUEST FOR 100 PER CENT SUSTAINABLE TYRES

Always crucial to a racecar's lap time, tyres now play a pivotal role in the pursuit of sustainability too. **Chris Pickering** talks to Cyrille Roget, technical and scientific communication director for the Michelin Group

THE environmental impact of motorsport is a deceptively complex topic. Even if you confine the analysis to the competition cars themselves – ignoring the transport of tens of thousands of spectators and hundreds of tonnes of support equipment for each major event – it's clear that their tailpipe emissions are only a small part of a far broader issue. And that's assuming the cars in question even have any tailpipe emissions.

Of all the various components that go into this mix, the tyres are perhaps the most frequently overlooked. A Formula 1 driver, for instance, can be issued with up to 13 dry sets for a race weekend – that's theoretically as many as 52 tyres for one event. Multiply that by 20 cars on the grid and 23 races this season and you have a staggering 23,920 over the course of the year. That's enough to drive around the earth nearly 5,000 times (assuming 20,000 miles per set on a standard road car).

The sheer numbers are mind-blowing, and it doesn't get much better from here. Numerous ingredients go into tyres, but the two principal groups of materials remain

53% SUSTAI
MATERIALS

ABOVE Michelin's latest race tyres feature 53 per cent sustainable raw materials. They range from natural rubber and carbon black recycled from end-of-life tyres, to orange and lemon peel, pine-tree resin, sunflower oil and scrap steel

natural rubber and synthetic rubber. The former is generally sourced from a relatively small band of hot, wet habitats, clustered around the equator, where it has been linked to high water usage and deforestation; the latter has traditionally been derived from crude oil, so it relies on fossil fuel extraction and some relatively energy-intensive processes.

> *"Lifecycle analysis for motorsport shows the usage phase is no longer the biggest impact; it's the materials"*

Of course, the number of tyres used in Formula 1, or even motorsport as a whole, is still a tiny percentage of those found on the 1.5 billion or so vehicles around the planet. So tiny that you could arguably ignore their impact. But if motorsport wants to lead by example, it's not an area that it can afford to overlook.

"We know that we have a journey to make tyres more sustainable," comments Cyrille Roget, technical and scientific communication director for the Michelin Group. "To do that we use lifecycle analysis, starting with the impact of extracting the materials. Alongside that we analyse the design, because that affects how much material you need, as well as the amount of energy required for the curing process. We've been working on weight reduction in tyres for a long time, partly because it reduces the curing time. Then you have the logistics associated with building and transporting the tyres, before you get to the usage ▶

Photos: Porsche AG

phase. This has an impact on the CO2 emissions of the car. And finally, you have the recycling."

For a typical road car, the CO2 incurred by the rolling resistance of the tyre during its usage phase is by far the biggest factor. This is something that the tyre industry has been working on for a long time now. Back in 1992, Michelin released the first road car tyres with silica compounds to reduce rolling resistance. In motorsport, however, the usage phase is a far smaller contributor.

"It's something that surprises people – even those who work with tyres," comments Roget. "When we do a lifecycle analysis for motorsport, the usage phase is no longer the biggest impact. Instead, it's the materials."

The biggest issue with substituting the materials is maintaining performance – both in terms of lap times and longevity. This, Roget acknowledges, is the prime concern for a racing tyre, and it makes developing sustainable alternatives all the more challenging.

One area that Michelin, along with most of the other tyre companies, has been researching is the extraction of silica from rice husks. The simplest way to do this is through combustion, but Michelin uses pyrolysis in a low-oxygen environment to avoid CO2 emissions.

Recycling

Recycled material is also a major area of interest. Earlier this year, at the Goodwood Festival of Speed, Michelin officially presented a new prototype tyre, which had previously been trialled in the Road to Le Mans support race on the hydrogen-fuelled GreenGT H24. Some 53 per cent of

ABOVE The commitment of Michelin and Porsche to better working conditions in the extraction of raw materials is demonstrated by the "CASCADE" (Committed Actions for Smallholders Capacity Development) project. The long-term partners are supporting small plantation farmers in Sumatra in Indonesia with education and training

RIGHT After introducing a tyre containing 46 per cent sustainable materials at Le Mans in 2021, Michelin took its technology a step further this year by raising the bar to 53 per cent of biosourced and recycled raw materials for its new high-performance racing tyre. It is seen here in action on Mission H24's hydrogen fuel cell-electric prototype

its raw materials come from sustainable sources, including biosourced, renewable or recycled components like natural rubber, orange peel and sunflower oil. The new tyre was also demonstrated at Goodwood on the all-electric Porsche GT4 ePerformance concept.

One of the materials used in these tyres was recycled carbon black (RCB). Carbon black is an anti-wear additive that also improves properties such as rolling resistance. It's a fundamental constituent of all modern tyres, and it's what gives the rubber its characteristic black colour.

Michelin has been working on ways to extract carbon black when the tyres are recycled at their end of life. Strictly speaking, RCB is an impure form of carbon black that's obtained by pyrolysis, with a small amount of residual ash. The tyres demonstrated at Goodwood are part of the company's ongoing research to investigate the suitability of RCB for high performance applications.

Meanwhile, a second option is what's known as sustainable carbon black (SCB). This too begins with pyrolysis, but it takes the oil that's produced during that process and uses this as the raw ingredient to create a pure, uncontaminated form of carbon black. In theory, this should perform better than the RCB, but Roget emphasises the need to take a holistic approach.

"For each new material we have to carry out a lifecycle analysis to ensure that it really is more sustainable than the existing approach, even if the alternative is sticking with a petrol-derived process," he explains. "For instance, we need to consider whether the oil used in the SCB might be better used in biofuel for the engine or resin for the tyres. That brings us back to the question of whether it's better to use RCB, SCB or perhaps both, and in what quantities."

> *"Motorsport is somewhere that we can test new technologies at a heavily accelerated pace"*

Two types of rubber

Natural rubber traditionally comes from rubber trees (scientifically known as hevea brasiliensis) but that doesn't have to be ▶

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BELOW The new, fully-electric Porsche 718 Cayman GT4 ePerformance ran at Goodwood on Michelin's sustainable tyres with no detriment to performance and safety

the case. Dandelion and guayule have been put forward as potential substitutes, but these too have their limitations. Michelin is monitoring both, but Roget explains that the level of chemical processing required to extract natural rubber from guayule makes it impractical at the moment, while dandelion requires much more land area than rubber trees to achieve the same yield.

"What we've seen in the lifecycle analysis so far is that it's much better to improve the efficiency of rubber tree cultivation than to switch to dandelion or guayule," he says. "We're open to changes, but as things stand today, it is not a sustainable option."

Admittedly, natural rubber is used sparingly in motorsport – it's more for applications like aircraft and earth movers where the tyre needs a strong resistance to tearing, which is hard to achieve with synthetic rubber.

The production of synthetic rubber generally begins with butadiene, which is produced by processing petroleum. As an alternative, the tyre industry is looking at renewable options such as woodchips and corn husks. These can be used to produce bioethanol, which is then converted to bio-butadiene. It's then combined with styrene, from recycled polystyrene, to create styrene butadiene-rubber (SBR).

"We can extract that styrene from a lot of household waste that has no application in recycling today," explains Roget. "In fact, we're starting our first industrial trial with a small pilot plant being built at our elastomer facility in Bassens on the west coast of France. We expect those technologies to arrive on an industrial scale pretty soon – around 2024 or 2025."

None of these processes exist in isolation. Michelin has formed a consortium with 12 partners called BlackCycle to look at the best use of RCB and the oil extracted from tyre pyrolysis.

"We set up this group two years ago to look at the best ways to use carbon black and its associated materials, but in the process we discovered that the same question applied to the plastics," comments Roget. "The reinforcement that's used in road tyres and also some competition tyres is PET (polyethylene terephthalate) – the same material that's used for plastic bottles. We're currently working with a start-up on an enzymatic process for digesting this plastic. Specifically, it digests the monomer, so the material that you end up with is completely pure again. We're creating the first industrial plant for this in Clermont-Ferrand currently."

Compared to the vast global demand for plastics, the tyre industry is a relatively small player, so ▶

> *"It's better to improve the efficiency of rubber tree cultivation than to switch to dandelion or guayule"*

Porsche AG

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SUPERTECH

Michelin set up the WhiteCycle consortium to liaise with other interested parties.

"As with the other materials, it's a question of finding the most efficient way to recycle them and the best way to use the product that we obtain at the end," comments Roget. "We've had a lot of people contact us since the consortium was formed, and we've seen an explosion in start-up companies developing technologies that could be very useful in the future.

"One of the benefits that Michelin has is that we have the capability to take ideas like that from small demonstrators to industrial scale. Motorsport is a key part of that, because it's somewhere that we can test new technologies at a heavily accelerated pace."

Motorsport as a laboratory

In addition to its partnerships with GreenGT and Porsche, Michelin has provided the tyres for a golden era of MotoGP. It also supplies the electric bike racing series, MotoE. As of 2022, these tyres use an average of 40 per cent sustainable content (slightly more for the rear tyres; slightly less for the fronts) with around 1,500 tyres supplied throughout the course of the season. On the road car side, it has set itself the target of using an average of 40 per cent sustainable

> *"We've been working on weight reduction in tyres for a long time"*

24h
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BELOW Toyota's fifth consecutive win at Le Mans extended Michelin's unbeaten run at the endurance classic to 25 victories since 1998

Toyota GAZOO Racing

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2022 NEW YORK CITY E-PRIX
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Formula E

ABOVE Thanks to the technologies it has developed in Formula E, Michelin has emerged a step ahead in the electric vehicle tyre market

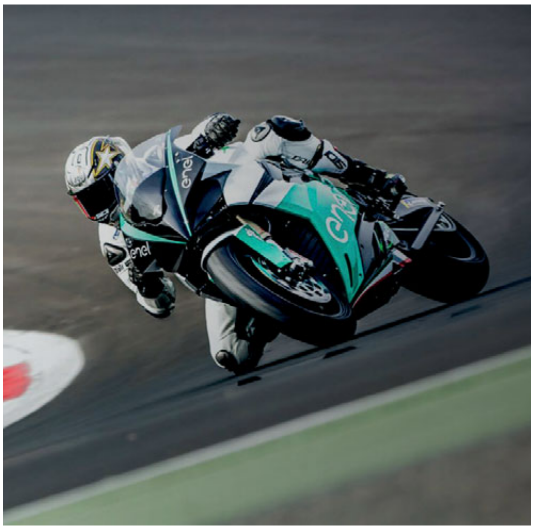
materials across its entire portfolio by 2030.

"For us, an important factor is being able to use the technology that we develop in competition for the mass market," notes Roget. "That's why we like competitions like the 24 Hours of Le Mans, where there are some similarities with road car requirements when it comes to extending durability and reducing fuel consumption."

Until the end of this year, the company also supplied the tyres for Formula E. This, we're told, was an interesting insight into the development of high-performance electric vehicle tyres, but it also posed several challenges that are unique in top-level motorsport. For a start, since the arrival of the Gen2 era, the cars have used the same set of tyres throughout their 45-minute events with no planned pitstops. Perhaps more importantly, they have also used the same treaded tyres in both wet and dry conditions – much as you would on a road car.

"Whenever we get involved with a competition category, we want to bring something new," comments Roget. "We always work with the organisers to see how we can improve the sustainability of that competition – whether that's transporting fewer tyres to each race, going further on each set during the race or having less choice over the course of the weekend. That's exactly the same philosophy that we apply in the market, where we're trying to reduce the impact of that form of mobility."

There's still a long way to go, but Michelin has set itself the target of bringing 100 per cent sustainable tyres to the road car market by 2050. With the pace of development and the technical freedom offered by motorsport, it's likely that we could see these demonstrated on the track a lot sooner. If that work can help to accelerate the adoption of truly sustainable tyres for more than a billion vehicles on the planet, then that alone would surely be enough to offset the entire carbon footprint of motorsport.



LEFT Michelin's progress in MotoE, where the development team has integrated no less than 46% sustainable material in the rear tyres, reflects the group's ambition to reach an average of 40% sustainable materials across all its ranges by 2030

ZERO EMISSIONS MAXIMUM EMOTION

The Nissan Formula E team enters the Gen3 era with access to one of the world's largest EV manufacturers, a collaboration with McLaren, and high expectations. **Chris Pickering** reports

THERE'LL be a new name at the start of the forthcoming Formula E season – on paper, at least. The arrival of the new Nissan Formula E team for Season Nine marks the Japanese brand's acquisition of what was formerly e.dams.

Based in the sleepy French town of Ruaudin, a few kilometres away from the Le Mans circuit, e.dams remains the most successful outfit in Formula E, with three consecutive teams' titles to its name in the early days of the championship. It began in partnership with Renault, switching to sister brand Nissan in 2018 ahead of Season Five. Now Nissan's own works team, it's aiming to make a big impact in the new Gen3 era, with a little help from one of the most famous names in motor racing.

McLaren Racing is another new addition to the Formula E ranks this year. The eight-times Formula 1 World Constructors' Championship winner is entering its own team, but Nissan will provide the powertrains for both outfits, and the two organisations will collaborate on R&D.

Such tie-ups are not uncommon in Formula E. In fact, virtually all the teams have some sort of partnership in place for the new season. But it's hoped that this will give Nissan the shot in the arm it needs for Gen3, having finished a lowly ninth in the recent championship (under the Nissan e.dams banner).

Technical upheaval

The Gen3 architecture also promises to shake things up. Nissan Formula E's technical director, Vincent Gaillardot, who's been involved with the championship since its inception, describes it as the series' biggest technological shift to date. Not only does it bring significant changes to the technical regulations – notably the switch to a dual-powertrain configuration – but there are new suppliers taking on key roles, such as Hankook replacing Michelin as the tyre provider. Throw in the semi-conductor shortage and the COVID pandemic, and it has been a long and complicated path to develop the new car.

"We started working on the Gen3 car more than two years ago. We had very little information at that time, so we had to make quite a lot of assumptions to begin our simulation work," explains Gaillardot.

At the beginning of the Gen3 project, the manufacturers established a simulation working group with the FIA. They agreed on a number of targets, including similar tyre behaviour and a similar aero map for the new car, which formed the basis of the team's early simulation work.

The FIA had its own Gen3 prototype, fitted with a generic Gen3 powertrain and used for track testing, but the first information didn't start to trickle through until December 2021, and it wasn't until March this year that the teams received detailed vehicle dynamics information.

> *"I don't think it's quite as crazy as Formula 1 yet, but data is definitely becoming more and more important in Formula E"*

"One of the question marks was how the new tyres would behave on track," he says. "The speed profile compared to the Gen2 car was something we had to try to understand quite early as it has a knock-on impact on your powertrain design."

The spec front powertrain, supplied by Lucid Motors spin-off Atieva, isn't used for propulsion, but it adds 250 kW of regenerative braking capacity, taking the total to 600 kW. On top of that, it has a significant impact on the vehicle dynamics.

At the front, the regenerative braking capability will be blended with conventional disc brakes, but even if the total amount of braking torque remains the same, there are subtle differences when that retardation ▶

RIGHT Nissan's e.dams operation has blossomed into a manufacturer entity for the first time for the Gen3 era

Photos: Nissan

comes through a differential and a set of driveshafts. If one wheel hits a bump, for instance, it could cause a torque transfer across the axle, locking a wheel. And on a more fundamental level, any changes to when and how the tyre is asked to provide longitudinal deceleration will also limit the amount of lateral load it can handle at the same time.

"We did some simulation work to understand the limitations of slowing the car down on the front powertrain," comments Gaillardot. "The Formula E rules very much favour energy recovery, so the way you balance regen on both axles against the hydraulic brakes [on the front] is extremely important – particularly at the end of the braking phase when the driver is turning into the corner."

The new cars are shorter and narrower, which impacts everything from the crash safety requirements of the manufacturer components to the setup of the suspension geometry. They're also significantly lighter, which means the weight targets for the manufacturer-provided parts has gone down dramatically. On top of that, there's now more power to manage, with the rear powertrain increased to 350 kW this season.

> *"It has become clearer and clearer that a technical partnership in Formula E can benefit both teams"*

Looking back

Many of the key engineers at Nissan Formula E have been with the team since e.dams' championship-winning days. Over the years, they have been responsible for some of the most innovative concepts in Formula E. It was e.dams, for instance, which pioneered the transverse motor configuration in Season Two – reducing frictional losses by eliminating the 90-degree turn found in a longitudinal installation. It was also among the first teams to move to a single-speed gearbox in Season Three, again reducing driveline drag.

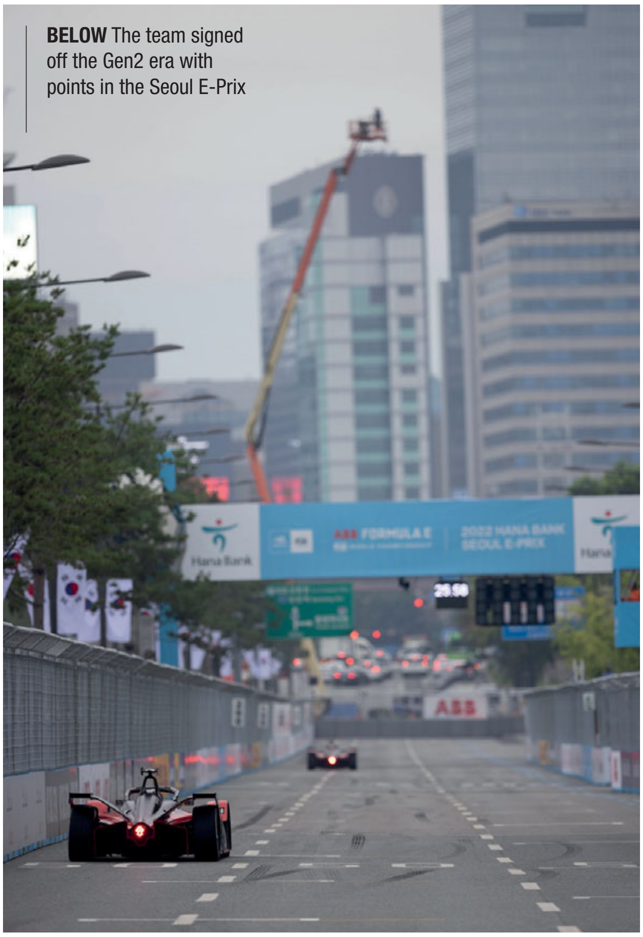
When Nissan arrived in Season Five it brought another ingenious – and controversial – technical solution. The team revived the twin-motor configuration

22
M. GÜNTHER
NISSAN
Shell Recharge
e.dams
Julius Bär

RIGHT The partnership with McLaren is intended to drive both teams' technical knowledge forward

BELOW Nissan initially made use of its EV experience to develop its Formula E racecars, having sold more than 500,000 Nissan LEAF vehicles since 2010

BELOW The team signed off the Gen2 era with points in the Seoul E-Prix



that others had experimented with in the early days of the series, except this was a particularly clever application of the concept. The Formula E rules limit the power that can be transmitted to and from the battery, but not the total power of the motors. While Gaillardot doesn't reveal too many details, it's thought that the car had one large motor and one small motor; both were used under power, but the larger motor was able to harvest all the electrical energy that could be put back into the battery. As such, the smaller unit could be left to spin up like a flywheel, storing additional kinetic energy without passing it into the battery.

"The twin-motor setup allowed us to use high speed inertia of the motor the most efficient way," comments Gaillardot. "When you have a single motor, you have to optimise the inertia of the rotor to the whole drive cycle. But with this twin-motor concept, we could split it into two different motor functions optimised to where we were on the track [and so] it was possible to benefit from the higher speed and higher inertia of the motor with no downside on efficiency."

The exact details still haven't been ▶

released, but it's believed that an epicyclic gearbox was used to control the flow of torque between the car and the two motors. No additional electrical storage device was used, and the design was homologated by the FIA and allowed to run for Season Five. In July 2019, however, it was announced that twin-motor setups would be banned for the following season. This left Nissan with just six months to re-engineer its powertrain concept for Season Six.

Pure engineering

"Unfortunately, the FIA decision didn't allow us to keep going on this technology, but in terms of pure engineering, this was really a massive breakthrough in our powertrain architecture," Gaillardot recalls. "It was a shame when it was banned, but we can understand that the FIA has a duty to keep the competition as close as possible."

Motor and inverter technology has continued to develop since then, but there have also been major advances in energy management and vehicle dynamics, we're told. Managing tyre life and degradation is said to be another key area.

> *"The twin-motor setup was a massive breakthrough in our powertrain architecture"*

"The energy and power going into and out of the battery is controlled by the IVT sensor. So you try to optimise everything you can between the IVT sensor and the wheels by any means that you can," comments Gaillardot. "What everyone tries to do is to play with this limit to extract the best car performance during braking and acceleration.

"It's not always just the powertrain – sometimes, for instance, you want to avoid creating too much tyre temperature, so we would try to avoid using the disc brakes on the Gen2 cars [which would transfer heat into the tyres]. And then you have to play with the electric motor as much as you can. The Gen2 rules gave us some scope to optimise that, so it was a question of balancing vehicle dynamics, tyre ▶

BELOW Formula E will help Nissan communicate its intention to electrify all its new vehicles by the early 2030s in key markets

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NTHER 22
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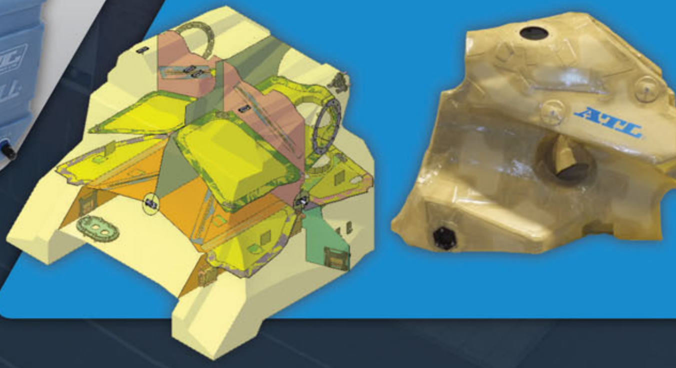

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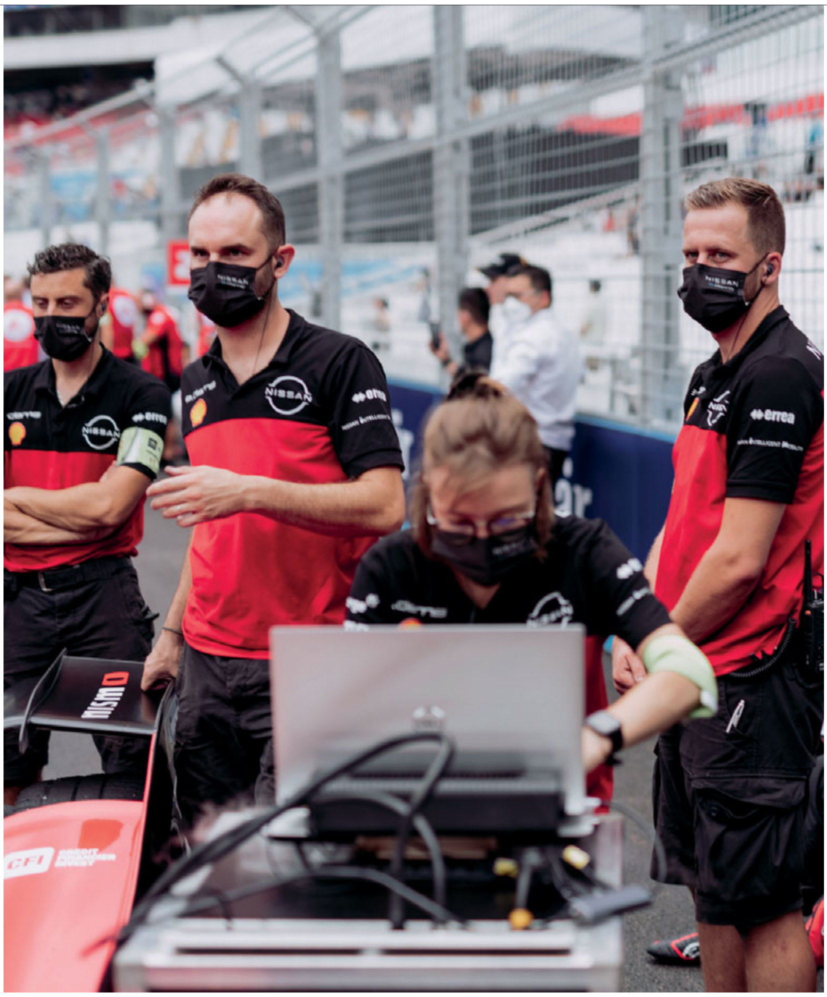

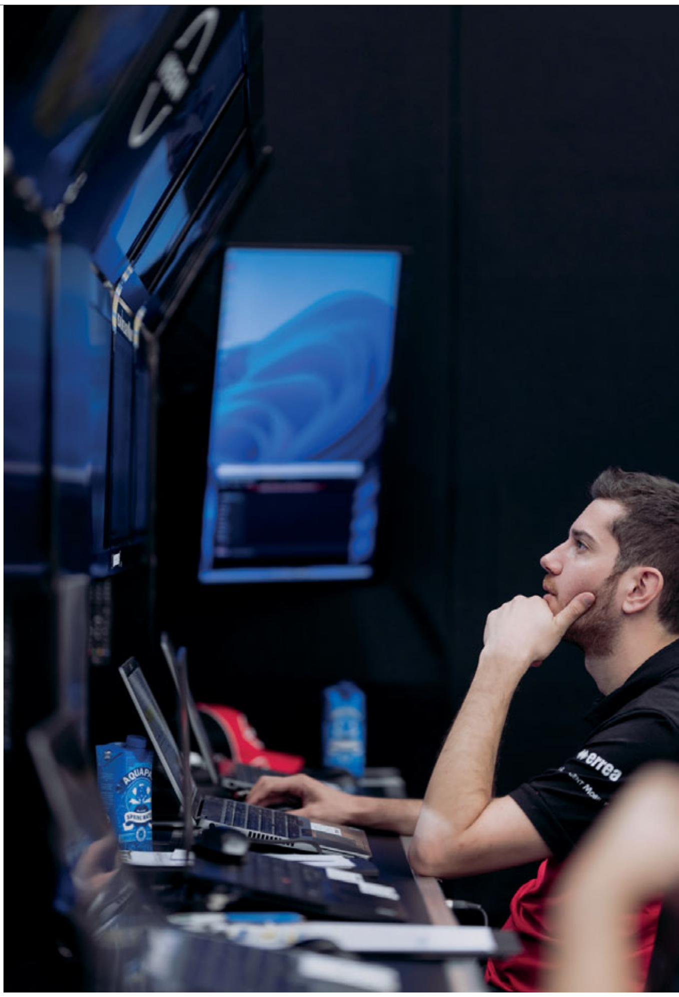

ABOVE With so many aspects of the new cars' technology to understand, data will play a more vital role in the series than ever before

optimisation and powertrain development. People often talk about the acceleration phase in Formula E, but there was performance to be extracted from the braking phase too."

A new partnership

Next season sees Nissan becoming a powertrain supplier in its own right. But as the team's general manager Tommaso Volpe explains, the tie-up with McLaren will be a two-way collaboration: "It has become clearer and clearer that a technical partnership in Formula E can benefit both teams. If you look at the progress of Venturi and Mercedes over the last few years, it's very impressive. And that's because they were acting as partners, not just independent suppliers."

On track, the two teams will continue to compete against each other (just as Porsche, Mahindra and Jaguar will with their own partner teams) but Volpe says they will share as much as the regulations allow in terms of powertrain development.

"There's a lot we can share," he comments. "For a start, there's data from the cars after the race, which means that we will both have access to the information from four cars rather than two. We can brainstorm and develop new ideas and new software tools that manufacturers would traditionally do independently. But in terms of data, the key one will be race data from the cars."

Formula E has always placed a high value on data, he points out, especially when it comes to understanding regenerative braking and energy management strategies. There's no live telemetry, which places pressure on the engineers to work quickly in between sessions when they have a chance to download and process data direct from the cars.

"I don't think it's quite as crazy as Formula 1 yet, but data is definitely becoming more and more important in Formula E, and that's why so many manufacturers have partnered up for Gen3," notes Volpe.

Much of the simulation and setup work takes place beforehand. Driver-in-the-loop simulation is used extensively for circuit familiarisation and setup, but once the free practice sessions commence it's more about data collection.

"When you go to a normal circuit, you can simulate so much more in advance. For a street circuit in Formula E, the surface details and even the layout of

> *"People often talk about the acceleration phase in Formula E, but there was performance to be extracted from the braking phase too"*

the track can change slightly from year to year, so there are a lot more unknowns," comments Volpe. "We spend three or four days in the simulator before we get to the track, so what we want to look at in free practice is the correlation to that data.

"In a way we've already done the race [in simulation] before we get to the track. If you get there and find that the wall is 20 cm further away or that the kerb is not exactly as it was in the simulation model, it changes your braking point, your energy management strategy and so on. You then need to change your calibration accordingly."

On top of these existing challenges, there's a whole new car for the drivers and the engineers to adapt to.

"I think one of the interesting things with the Gen3 car is that it will be a really challenging car to drive," concludes Gaillardot. "The narrower track, the extra power and lots of other things mean that the driver's job will get a lot harder. As engineers, we need to make life as easy as possible for the driver, because it will certainly be more challenging for them to be at the limit."

This all bodes well for next season, and in particular for the Nissan team, which now has full works status and access to one of the world's largest electric vehicle manufacturers, not to mention a promising new collaboration with a motorsports legend. We won't find out how well that shapes up until the curtain falls on the new Formula E season. But now we don't have long to wait. RT

BELOW Nissan was among the first to commit to Formula E's new Gen3 era, which introduces a dual-powertrain configuration

nismo
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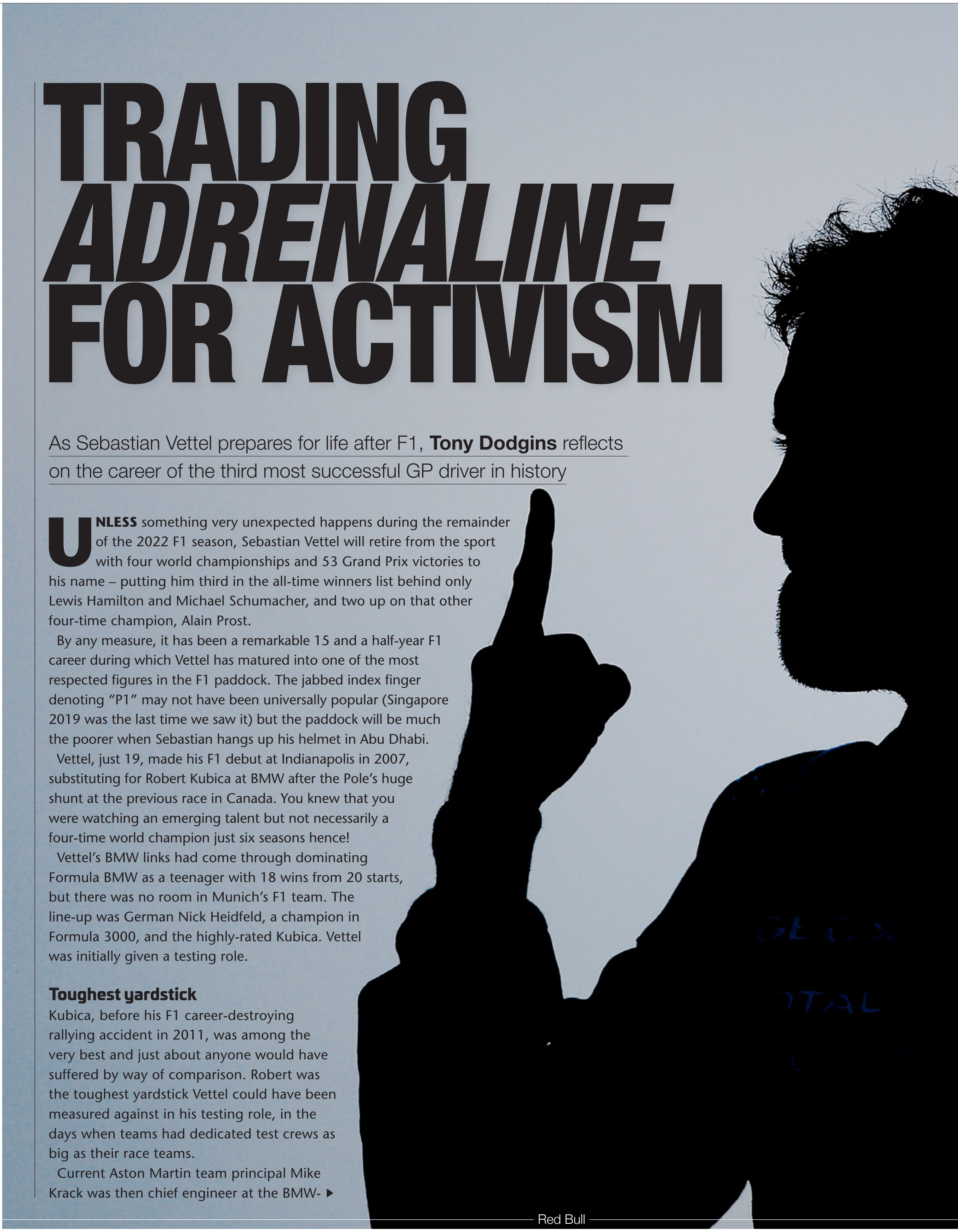


Red Bull

TRADING *ADRENALINE* FOR ACTIVISM

As Sebastian Vettel prepares for life after F1, **Tony Dodgins** reflects on the career of the third most successful GP driver in history

UNLESS something very unexpected happens during the remainder of the 2022 F1 season, Sebastian Vettel will retire from the sport with four world championships and 53 Grand Prix victories to his name – putting him third in the all-time winners list behind only Lewis Hamilton and Michael Schumacher, and two up on that other four-time champion, Alain Prost.

By any measure, it has been a remarkable 15 and a half-year F1 career during which Vettel has matured into one of the most respected figures in the F1 paddock. The jabbed index finger denoting "P1" may not have been universally popular (Singapore 2019 was the last time we saw it) but the paddock will be much the poorer when Sebastian hangs up his helmet in Abu Dhabi.

Vettel, just 19, made his F1 debut at Indianapolis in 2007, substituting for Robert Kubica at BMW after the Pole's huge shunt at the previous race in Canada. You knew that you were watching an emerging talent but not necessarily a four-time world champion just six seasons hence!

Vettel's BMW links had come through dominating Formula BMW as a teenager with 18 wins from 20 starts, but there was no room in Munich's F1 team. The line-up was German Nick Heidfeld, a champion in Formula 3000, and the highly-rated Kubica. Vettel was initially given a testing role.

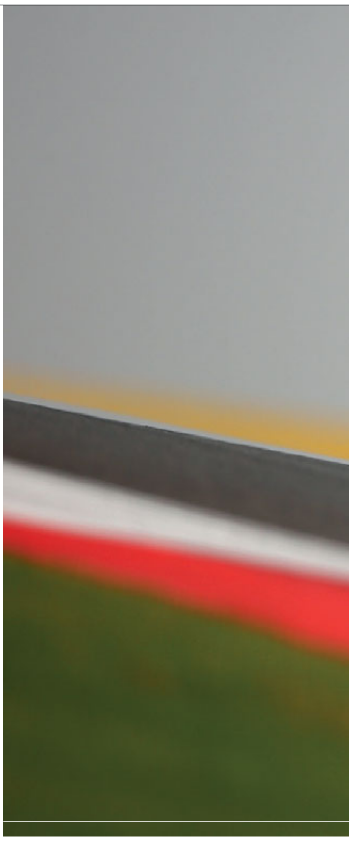
Toughest yardstick

Kubica, before his F1 career-destroying rallying accident in 2011, was among the very best and just about anyone would have suffered by way of comparison. Robert was the toughest yardstick Vettel could have been measured against in his testing role, in the days when teams had dedicated test crews as big as their race teams.

Current Aston Martin team principal Mike Krack was then chief engineer at the BMW- ▶

ABOVE & LEFT The jabbed finger, indicating number one, irritated many people (though not Red Bull design guru Adrian Newey, top). Nevertheless, Vettel leaves the sport as a hugely popular figure

> *“He had some sensational qualities. There were things he did and you just had to take your hat off to him”*



Sauber squad and re-united with Vettel this year. He told F1's Beyond The Grid podcast that Kubica "was the best I've ever seen."

Every successful driver needs a stroke of luck and Vettel's was the fact that with Kubica back next race, he was also part of the Red Bull junior programme. After his promising debut performance in the US, where he qualified seventh and claimed the last point for eighth place, he was given a Toro Rosso seat for the remainder of the year in place of American, Scott Speed.

Although BMW and Kubica was challenging for the championship halfway through the following 2008 season, it was to Krack's dismay and disappointment that rather than develop the car that took pole and won in Canada '08, they elected to concentrate on the '09 car, significant regulation changes lying ahead. A crack at the championship, no pun intended, went begging and by the end of the following year, BMW was out of F1.

Vettel, meanwhile, was thriving at Toro Rosso. Qualifying for the 2008 Italian GP at Monza was held in the rain and Sebastian took a stunning pole. Nobody thought that he could possibly convert it into the first ever victory by a Red Bull-backed car, but that's precisely what happened.

The team's technical director that day was ex-Ferrari/McLaren man Giorgio Ascanelli, who had worked with Ayrton

BELOW He might be popular, but a ruthless streak was revealed when he disobeyed team orders in 2013 during the infamous 'Multi 21' dispute with team-mate Mark Webber

Red Bull
INFINITI
TOTAL
PETRON
Black

Red Bull

ABOVE Vettel adapted his driving style to suit Red Bull's diffuser technology and was rewarded with four successive titles

GRAN PRI
SANTANDE
D'ITALIA
MONZA 2008
BRIDGESTONE

Red Bull

LEFT Victory for Scuderia Toro Rosso at Monza in 2008 still ranks as one of sport's great underdog triumphs

INFINITI
Q100
RENAULT

Red Bull

Senna. Ascanelli had been around the block and was not a man prone to hyperbole. "It was a drive of which Ayrton himself would have been proud," he said.

At that stage, the Red Bull senior team was yet to win a race – Vettel would claim that honour too – and with David Coulthard retiring at the end of the '08 season, Sebastian was the natural choice to replace him, alongside Mark Webber.

Command of Cockney slang

Team principal Christian Horner recalls the early days: "The thing that stood out about Seb was that from the very beginning you could see that he was very focused and his work ethic was totally Germanic. And although he worked late, he also had a great sense of humour. He fitted so well into a British team and embraced the culture immediately.

"He endeared himself across all areas of the business, whether it was turning up with chocolates for secretaries or learning the lingo in the garage. His command of cockney slang became legendary. His ability to just relate to people and get the best out of them, was absolutely great. And he was formidable in the cars that we produced in that period."

A man who came to know all about that was Webber, himself yet to win a GP at the beginning of '09. Over the winter, Mark badly broke a leg when a bicycle he was riding, in his own Tasmanian Challenge charity event, was hit by a Nissan Patrol, just as he was about to get his hands on a new-rules Adrian Newey car and go head-to-head with Vettel. It could have torpedoed the career of a lesser man and it is to Webber's great credit that he rose to the challenge, taking his first win at Nürburgring in '09 and being a big enough thorn in Vettel's side for the rivalry to become spiky, in 2010 particularly.

It says much about both men that they were able to co-exist ▶

> *"Renault did a great job of blending cylinder cut, ignition timing and throttle position to give what became known as 'hot blowing'"*

BELOW His F1 break came at Indianapolis in 2007, substituting for the injured Robert Kubica at BMW

BMW

Photos: Ferrari

in that cauldron Red Bull environment for five years. The reason is that while both are hugely competitive individuals, they are both fundamentally decent fellows. Webber often felt that Red Bull was "Seb's team" – the "not bad for a No2 driver" Silverstone win and the Malaysia Multi 21 incidents springing immediately to mind. He admitted that sometimes Vettel got under his skin, but couldn't find it within himself to properly dislike him. "He's basically a decent guy and I like his family…" Mark said.

Horner again: "They were halcyon days: massive competitors, big teams that we were up against, and some outstanding successes. Sebastian, at that stage, was very focused on achieving. Not just success, but going for and achieving records. They meant a lot to him.

"The fans did as well. I remember just seeing him collect every bit of memorabilia and gift he was given in Japan… Some of them were slightly weird but he kept absolutely everything, insisted on taking everything home. He was a pleasure to have in our team and we achieved some great things together.

"He just got better and better. In 2009 we, like him, were a young team, and we made a few mistakes. In 2010, he was the stand-out driver that year, had a lot of unreliability and, against the odds, won the championship at the last round. In 2011 he built on that, then '12 was a super-tough year. He'd only won one race before we left Europe. And then won, I think, four on the bounce to go head-to-head with Fernando in that final race in Brazil.

Truly outstanding

"But by the time we got to '13, he just absolutely dominated and achieved those nine victories in succession. That, for me, was his pinnacle year: he brought everything together and was just truly outstanding."

ABOVE & BELOW The Ferrari dream was fuelled, in part, by his boyhood hero Michael Schumacher (with whom he is pictured at The Race of Champions, above). Despite victories, he never quite regained the same heights he had reached with Red Bull

When Horner refers to Vettel being formidable in the cars that they produced at that time, he is talking in particular about the double and blown diffuser Red Bulls which Sebastian was able to make work in slow corners in a way that Webber sometimes couldn't. In the quick stuff, like Barcelona Turn 9 and Copse at Silverstone, Mark was often quicker.

In his autobiography, Webber, who went down to the wire with Vettel for the 2010 championship, outlines that it was wearing to be involved in an intra-team power struggle, but adds, "None of it should detract from the job that Seb did. I can say with absolute honesty that he is a better all-round F1 driver than I ever was. He had some sensational qualities. There were things he did and you just had to take your hat off to him. He had a computer-like approach to executing race weekends." ▶

> *"He had a computer-like approach to executing race weekends"*

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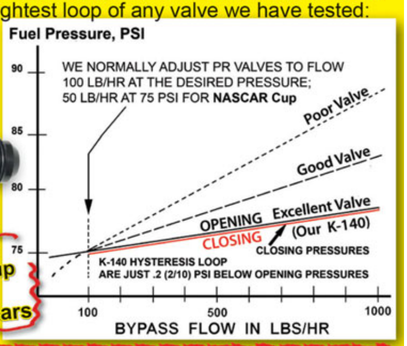

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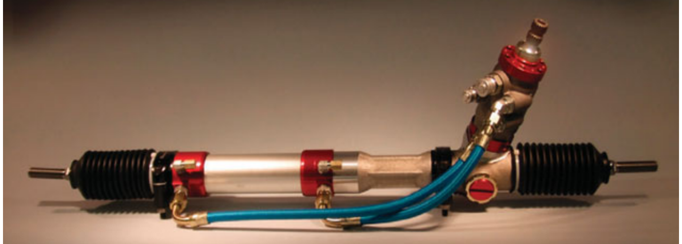

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ABOVE Passionate about the environment, he insisted that his recent demonstration of Nigel Mansell's title-winning FW14B should also champion sustainability. The iconic car was fuelled with P1 Racing Fuels' P1 Eco100 RS, a carbon-neutral fuel

Vettel and his technique in slow corners made the most of Adrian Newey's double diffuser Red Bull of 2010 but the FIA came to think that, after allowing them in '09 much to Newey's chagrin, the double diffuser cars were now producing too much downforce and hence banned them for the following season.

Whereupon Newey set about clawing back some of the downforce. In his book 'How to build a car' the design ace explains, "The side exhaust blowing into the double diffuser on the RB6 had proved effective and the drivers could feel the extra downforce from the exhaust when it blew hard on the exit of low-speed corners. Using that seemed a way that we might be able to recover some of the lost downforce.

Hot blowing

"At the same time, we knew that increasing the rake of the car, i.e. raising the rear ride height, would give us more downforce as it turns the whole of the floor into a gentle diffuser as well as lowering the front wing. The problem is that the tyre squish area and the loss that the dirty jet of air from it causes, becomes more and more difficult to manage the higher the ride height.

> *"Sebastian was very focused on achieving. Not just success, but going for and achieving records"*

"So, I thought that if I could arrange the exhaust in such a way that it was pointing in the rough direction of the tyre squish, that could be a way of trying to manage it by having very high-energy exhaust gas blowing down and back into this low-energy squish area.

"The problem is that with the ride heights we were targeting in low-speed corners, where squish really becomes a problem, the rear of the car is around 100 mm above the ground. That means that you somehow have to get the exhaust floor to drop that 100 mm or so, which became the main focus of our development work."

Once the team got it working, the downforce gains were huge, to the point that with the exhaust blowing hard, Red Bull was almost back to where they'd been with double diffusers in slow corners. To maximise the effect of course, they needed the exhaust to be blowing all the time. Normally, when a driver brakes, changes down and comes off-throttle, there's next to no exhaust flow.

Back in '94 at Williams, when they last had exhausts blowing the diffuser, Newey had approached Renault's Bernard Dudot about the possibility of keeping the throttle open around the lap and regulating the power in some other way, via such as spark plug cut to individual cylinders and ignition timing. But when blown diffusers were banned in the aftermath of Imola '94, the project ▶

BELOW The four-time champion underlined his environmental stance when he retired from the 2021 British GP but, instead of leaving early, stayed behind to help clean the grandstands

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was abandoned. Some 17 years on, with Renault now under Rob White's technical leadership, Newey got them to revive it. Renault did a great job of blending cylinder cut, ignition timing and throttle position to give what became known as 'hot blowing,' which was key to Red Bull and Vettel's second championship success in 2011.

End of an era

Sometimes the feeling was perhaps not entirely natural, but Vettel's typical work ethic that Horner outlines, intelligence and application meant that he was on top of it much quicker than his rivals.

The introduction of hybrids to F1 in 2014 brought to an end 'the Vettel/Red Bull era' as Mercedes invested huge time and resources into acing the return to turbocharged engines. The power unit was now dominant and Mercedes-engined cars had a clear advantage. Daniel Ricciardo was also something of a rude awakening for Sebastian, and comfortably best-of-the-rest behind the dominant Hamilton/Rosberg Mercs with three victories in a 2014 season that was winless for Vettel – for the first time since that Toro Rosso win in 2008.

The cards once again fell well for him though, Fernando Alonso choosing precisely that moment to fall out with Ferrari. Sebastian's childhood hero was Michael Schumacher and he, too, wanted to win a championship with Maranello.

He never managed it, but it didn't take long for Vettel to return to the top step of the podium with a fine win in Malaysia 2015 in just his second race in red, the 40th victory of his career. There were further wins in Hungary and, memorably, Singapore, as Vettel comfortably outpaced Ferrari team-mate Kimi Raikkonen, even though Mercedes was still in a class of its own.

After a winless 2016, Ferrari was a much more potent threat in 2017/18, with Vettel winning five races in each season and finishing championship runner-up to Hamilton in both seasons. But, in '18 particularly, there was a catalogue of errors and the pressure was mounting internally. Then Ferrari chief, the late Sergio Marchionne, wanted to see Vettel measured up against coming-man Charles Leclerc rather than "laggard" Raikkonen.

Vettel rapidly found he had his hands full with the young Monegasque, who was in just his second season of F1, and when his Ferrari contract was not renewed after Maranello's 'year from hell' in 2020, Sebastian took up a two-year offer from Aston Martin.

With Lawrence Stroll's money behind the team, Vettel probably hoped that the level of competitiveness would advance more rapidly than has been the case. Now 35, he has become actively involved in promoting diversity and environmental awareness. You get the impression that he will not have any problems filling his time, even if his immediate direction is not clear in his head.

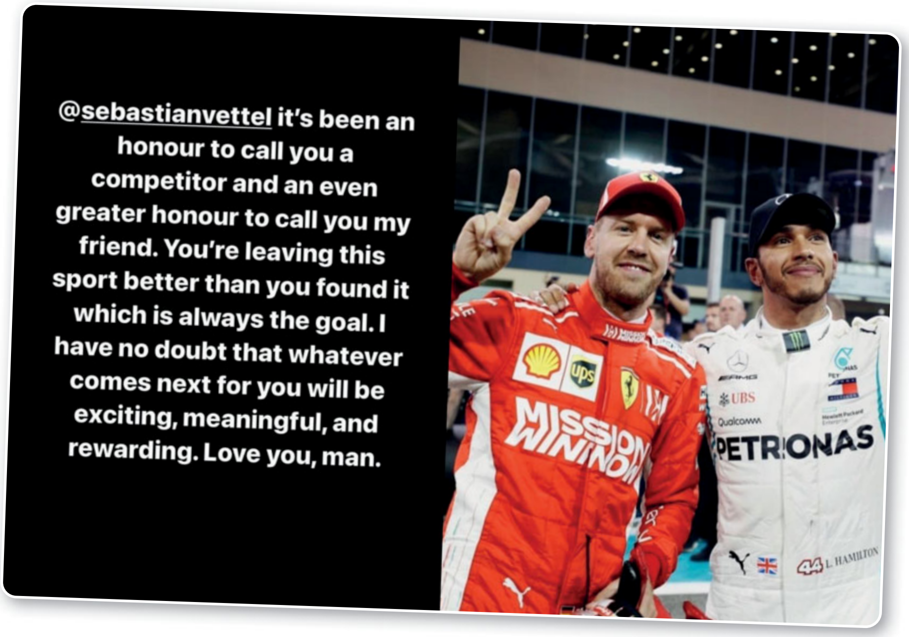
"Having watched him grow from a boy into a man, Sebastian is a very principled guy," Horner says. "He has very strong beliefs. We've seen that in the latter stages of his career, very much standing up for things that he feels passionate about, and rightly so.

"His family is important to him and he's a very private man. I'm so pleased to see he's become an Instagramer recently! And while his Formula 1 career comes to an end, he's got a lot that I'm sure he wants to do in his life. And I'm sure he's going to go on and do some great things. It'll be sad not to see him around, but I think the timing is right. It's not nice to see him running around in the midfield – he

> *"The timing is right. It's not nice to see him running around in the midfield – he doesn't deserve to be there"*

ABOVE An increasingly carefree demeanour marked his time at Aston Martin

RIGHT Like Lewis Hamilton, Vettel has become increasingly known for his activism. This is how Hamilton reacted to the news of his friend's retirement



@sebastianvettel it's been an honour to call you a competitor and an even greater honour to call you my friend. You're leaving this sport better than you found it which is always the goal. I have no doubt that whatever comes next for you will be exciting, meaningful, and rewarding. Love you, man.

doesn't deserve to be there.”

Vettel's eloquent appearance on BBC's Question Time earlier this year made you think that, perhaps, he'd ‘outgrown’ F1. Or at least as Horner says, outgrown trundling around in the midfield.

But what will sate the competitive desires that sometimes got the better of him over the radio, such as when he swore at the late Charlie Whiting? Top fellows both, Charlie appreciated the heat of the moment and where Vettel was coming from and cut him some slack. Something that may not have been the case with someone for whom Charlie had less respect! And Vettel, sheepish, was quick to apologise too.

Genuine fan

A genuine fan, with deep knowledge and interest in the sport, Vettel would make a great pundit but, he says, it's not something on his radar. For the moment, he will content himself with family time and tinkering with his classic bikes. Deservedly so.

RIGHT An appearance on the BBC's ‘Question Time’ underlined his growing awareness of life outside F1. Vettel confessed to feeling “a hypocrite” over fighting climate change while travelling the world

Michael L. Levitt/LAT Images/IMSA

LEFT Acura's ARX-05 raised the bar time and again in DPi, winning the teams', manufacturers' and drivers' championships in 2022, as it had done in 2019 and 2020

MASTERS OF DPi PLOT GTP GLORY

Chris Pickering talks to some of the key engineers behind the DPi Acura ARX-05 that set the benchmark for a golden era of IMSA sportscar racing

THE Daytona Prototype International (DPi) era has been a huge success for IMSA. While the top category of the World Endurance Championship was relegated to a sideshow with just one major OEM-backed team, the North American endurance scene was thriving with hard-fought battles between more than a dozen teams representing four major manufacturers at its peak.

The competition was intense, but it was Acura that proved strongest overall, claiming the manufacturers' crown three times in the five seasons it contested, and finishing a close second on both other occasions. As the DPi category prepares to give way to the new LMDh format and the return of the IMSA GTP class, there's plenty that Acura can take away from the last five seasons.

The roots of the project stretch back to 2016, when it was decided that Acura – Honda's performance brand in North America – would return to sportscar racing. As with its previous LMP2 and LMP1 programmes, the task of developing the new car, the ARX-05, fell to Honda Performance Development (HPD) in Santa Clarita, California.

HPD already had a proven endurance racing engine in the HR35TT, a 3.5-litre twin turbocharged V6 based on Honda's J35 production block. It had been racing in various sizes and configurations since 2011. On the way it had picked up multiple victories at Sebring and Daytona, not to mention a class win (in 2.8-litre guise) at Le Mans. It had even scored class victories at Pikes Peak and in the Baja 1000 off-road event. That just left a question of which of the four officially-approved DPi/LMP2 chassis manufacturers to use for the new car.

"We visited all four of the constructors in the summer of 2016 to evaluate who we thought was the best partner to work with," recalls HPD's Matthew Niles, former large project leader for the DPi programme. "We settled on ORECA as they had a very nice car and a good track record at Le Mans. They also suited the way that we wanted to work with our own in-house capabilities."

The project officially began in September 2016, but it wasn't until the end of that year that things really began to take shape. One of the first challenges was that the cooling demands of the production-based twin-turbo Acura engine were significantly higher than those of the LMP2 car's naturally aspirated V8 race engine. This drove a lot of work on the cooling system design and the aerodynamic development.

"ORECA had already done a really good job on the aero with that car for the new LMP2 regulations that were coming in 2017," notes HPD aerodynamics engineer, Jonathan Seaman. "We had the underfloor, the splitter and the rear wing from the ORECA 07. Our job was basically to take advantage of that, and then apply Acura styling, which sounds simple, but given the high downforce and high efficiency targets for the DPi car, it was actually pretty challenging."

The Cadillac and Mazda DPi cars had already been seen testing, but Seaman and his colleagues encouraged the Acura designers to stick with a clean sheet. By February 2017 they had a series of concepts for the front and rear of the car that they could begin simulating in CFD. Those first ▶

Michael L. Levitt/LAT Images/IMSA

iterations struggled for downforce and efficiency, but from then on, the designers and the aerodynamicists worked hand-in-hand to refine the package.

"We took those concepts and evolved Acura's vision for the design into a car with LMP2 levels of downforce and efficiency," comments Seaman. "One example of that is the hammerhead that we had on the DPi car, and now also on the LMDh car. That was actually born out of an Acura concept. It started off going right the way back to the windshield, so we've shortened it, and it's given us a unique look to the racecar."

While the twin-turbo V6 was still a front-running engine in its 2016 spec, HPD elected to incorporate a series of updates aimed at maximising reliability. When HPD had switched over to direct injection in 2013, the company had used a production crankshaft from the Acura RLX sedan. However, it transpired that one of the engineers working at HPD at the time, Taku Yamasaki, had led a redesign for Acura's other V6 engines while working on the road car side. His production design was sent to precision machining specialist Koganei Seiki, and promptly adopted for the race engine. This slashed nearly a kilogram from the mass of the race engine's crank, as well as improving its strength.

While the DPi crankshaft took its inspiration from production, the technology transfer sometimes flowed the other way as Paul Yannacopoulos, HPD engine development engineer, explains: "The fuel system that we settled on for the race engine was six factory port injectors up top and then six factory DI injectors at the bottom, fed by the original pump. Honda R&D in Japan enquired how we were doing it, and then when the NSX engine showed up at the start of the GT3 programme we looked at it and realised that it was the same. It was a genuine case of racing leading production."

Another evolutionary change for the new engine was the addition of a deck plate, he recalls: "The factory engine is an open deck, as most production engines are, and we'd started to see a bit of movement on the sleeves. With DPi, the power level was only going to go up from where we'd run before and we were concerned that it would worsen with the higher output, so we worked with a

Chris Owens/LAT Images/IMSA

LEFT HPD President David Salters compares the Acura ARX-05 with the new Acura ARX-06

RIGHT The development of HPD's 3.5-litre twin-turbocharged V6 involved genuine technology transfer between race and road

> *"One of our strengths is that our race engineers had enough software control to tailor things for the track and the conditions at each event"*

supplier to add a deck plate to keep everything solid. We'd already done a lot of head gasket work so that we had zero leaks for the whole programme."

Aside from the hardware, there was also a lot of work put into software optimisation. Drivability, boost management and traction control are particularly critical on a turbo engine, Yannacopoulos points out, especially when you're up against large capacity naturally aspirated engines that don't face the same sort of challenges.

"An engine can be great on the dyno, but if it can't give the driver what they're asking for, you either end up spinning the wheels and wearing down the tyres or sitting there waiting," he comments. "And that's something that can change from race to race. I think one of our strengths is that our race engineers had enough software control to really tailor things for the track and the conditions at each event."

LEFT It was testament to the DPi ruleset that the scrap for this year's honours went right down to the last few minutes of the Petit Le Mans finale

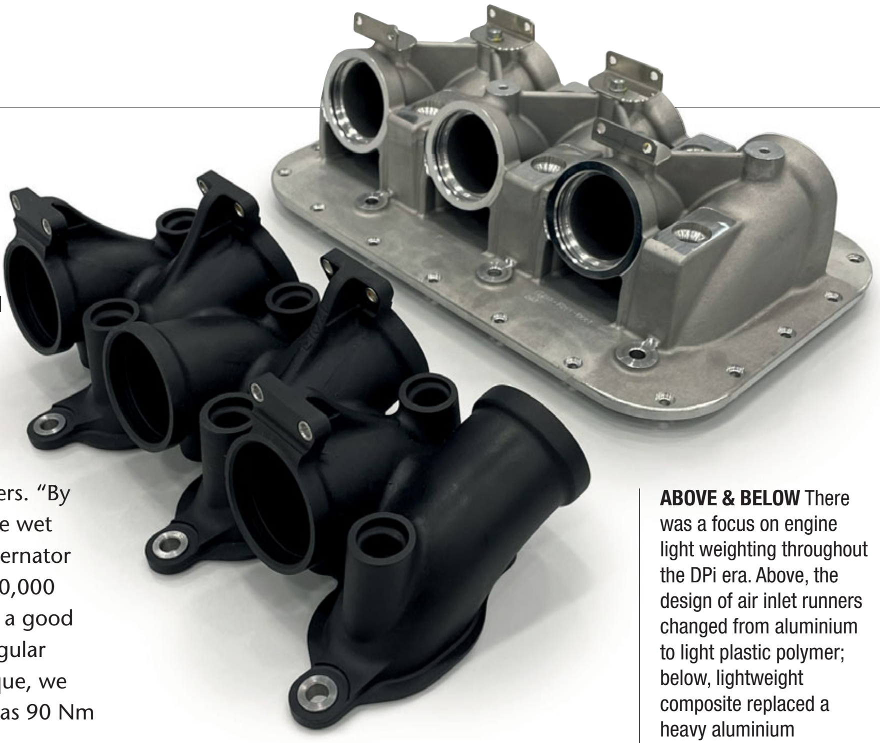
Teething troubles

HPD and Team Penske, which would be running the car in its first season, travelled to Paul Ricard in July 2017 to test the first prototype with ORECA. They were assisted by a local LMP2 team, with Bruno Senna at the wheel. It was just seven months since the start of the project.

"It was interesting working with Team Penske," recalls Niles. "We'd been competing against them in 2007 and 2008, when Penske was running in ALMS. Quite a few of the engineers on both sides were still there when we came to start testing the DPi car, so there was a lot of reminiscing about those days. Now, of course, they're about to return for LMDh, so we're going to be up against them again, which is pretty exciting."

The testing itself went without a hitch and the team were feeling confident going into the first race at Daytona in 2018. A BoP change after the Roar test a few weeks previously had caused a degree of frustration, but things were looking good, and the Number 7 car had only missed out on pole by seven thousandths of a second.

During the night, the Number 6 car captured the lead, but it wasn't to last. Three laps later, Dane Cameron was called into the pits with an alternator issue, which turned out to be a loose nut on the pulley. ▶



ABOVE & BELOW There was a focus on engine light weighting throughout the DPi era. Above, the design of air inlet runners changed from aluminium to light plastic polymer; below, lightweight composite replaced a heavy aluminium casting air plenum

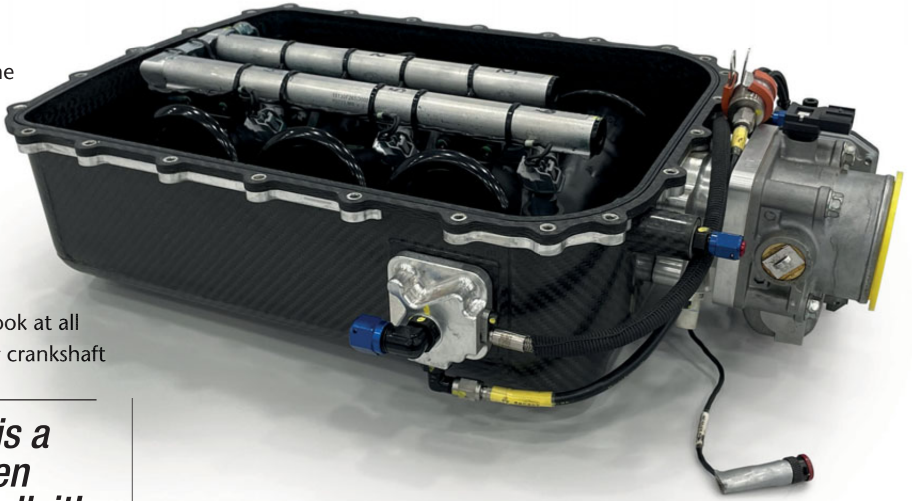
The belt-driven production alternator was retained on the race engine, with the standard clutch pulley substituted for a solid item. Initially the team were at a loss as to how the nut had come undone.

"A group of us were in the factory doing hand calculations after the failure, trying to work out what had happened," recalls HPD president and technical director, David Salters. "By the time we'd applied traction control in the wet to the engine, this poor little production alternator was trying to accelerate itself angularly at 90,000 rpm per second, which we realised was not a good thing. Going back to first principles that angular acceleration times inertia gives you the torque, we worked out that the torque on the pulley was 90 Nm and the nut was done up to 60 Nm."

Collision

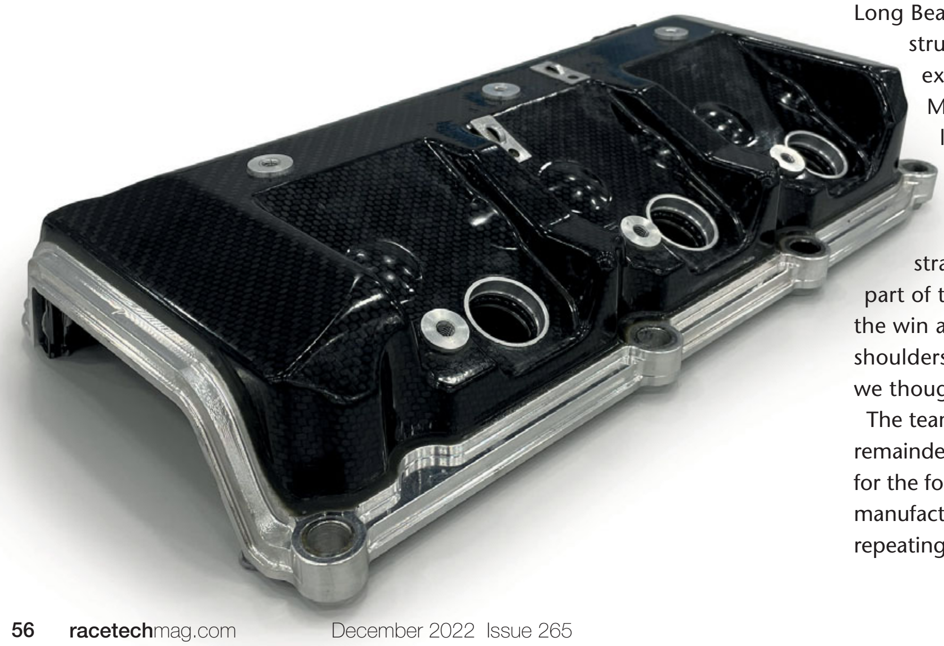
By the time the alternator was changed, the Number 6 car was 24 laps down and out of contention for a major result. Shortly afterwards, the Number 7 car collided with another DPi competitor, damaging the cooling system and prompting its own lengthy trip to the pits. In the end, they finished ninth and tenth.

"It just goes to show, in racing, you can look at all the big picture things like redesigning your crankshaft and then something little comes and sinks your ship," comments Salters. "We then threw everything at it to make sure it didn't happen again – it's impossible to disassemble the alternator that we race now; the pulley is essentially welded on."



> *"A racing company is a bit like a duck. When things are going well, it's all calm on the surface, but there's still lots of flapping underneath to ensure it stays that way"*

BELOW The cylinder head cover was made of a mix of carbon composite and aluminum frame



Two DNFs at Sebring and mid-pack finishes at Long Beach followed, and still the Acuras were struggling to deliver the results that the team expected. But an emphatic 1-2 victory at Mid-Ohio in May showed that there was light at the end of the tunnel.

"With the team, the car and the drivers that we had, we came into the series with high expectations of winning races straight off the bat," recalls Niles. "The first part of the season was quite frustrating, so getting the win at Mid-Ohio was kind of a weight off our shoulders. That showed we could actually do what we thought we could do."

The team's mixed fortunes continued for the remainder of 2018, but everything came together for the following season. Acura took the teams', manufacturers' and drivers' championships in 2019, repeating the same feat in 2020 and again in 2022. ▶

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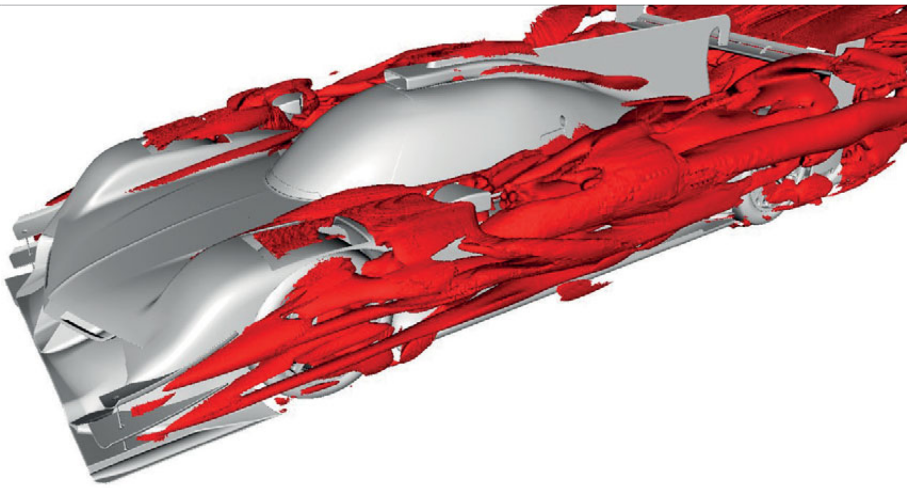

ABOVE An early iteration of the ARX-05 modelled with Computational Fluid Dynamics

Stable platform

The fundamentals of the Acura ARX-05 remained largely unchanged throughout the five-year campaign. It's testament to the stability and sheer common sense in the IMSA rules package that no radical changes were required.

"The stability that existed in IMSA helped everyone to focus. I think that allowed both the manufacturers and the organisers to do their jobs very well," comments Salters. "And it resulted in close racing. Typically, those championships were being fought in the last half-hour of a 10-hour race at the end of the season."

Lee Niffenegger, large project leader for the second half of the DPi programme, concurs: "There's a consistency in the way the BoP has been managed across all of IMSA's platforms, from DPi and GTD down to TCR and GT4. At that time, DPi was the highest level car that IMSA had done its own homologation process for, and despite some ongoing discussions over what was covered by the homologation and what wasn't, it generally worked very well. I think that probably helped both IMSA and the manufacturers to understand how the homologation process should work for the LMDh cars. Understanding, for instance, which things can be left free because they don't directly affect the performance."

The team itself underwent a learning process during this time. Salters describes endurance racing as "an art as much as a science" based on things like finding the right groups of drivers to share the car, optimising tyre usage and ensuring that the team is ready for any eventuality.

There were also engineering developments behind the scenes, but they tended to focus on the details. Software was a big area, particularly where drivability was concerned. For instance, the single drive-by-wire throttle body was taken from a production engine, and a lot of calibration work went into managing the pressure inside the intake plenum to overcome the inherent delays of filling the system with the turbos.

While the design of the components was, in many cases, fixed by the homologation, the team were also constantly monitoring production methods and quality control. Details such as manufacturing processes can change subtly from one supplier to the next, impacting the performance and durability of the part.

"A racing company is a bit like a duck," remarks Salters. "When things are going well, it's all calm on the surface, but there's still lots of flapping underneath to ensure it stays that way. We've taken what starts off as a road car engine and given it twin turbos and hundreds of extra horsepower with lots of small batch parts. If a supplier changes the machine they use to apply their coatings, for instance, things can change from one batch to the next. Between us and our suppliers we have a whole group of quality engineers and inspection people, and right to the last race we were still doing durability testing to prove out our parts."

The next step

The success of the DPi format has certainly paved the way for LMDh, and in some respects that new category is an evolution of its predecessor. Key to that success was the ability to combine close racing with manageable costs.

"With DPi, IMSA proved to the world – and to the FIA and the WEC – that you can keep costs in check and still put on a good show," comments Niles. "I think there were just a couple of elements that weren't quite there, with electrification and things changing in the world."

Salters concurs: "The world is moving on, and to IMSA's credit, I think they understood that you need to be relevant. That's a really important point – for ▶

> "In racing, you can look at all the big picture things like redesigning your crankshaft and then something little comes and sinks your ship"

BELOW Aero development of Acura's styling vision resulted in the distinctive hammerhead seen here on the DPi car

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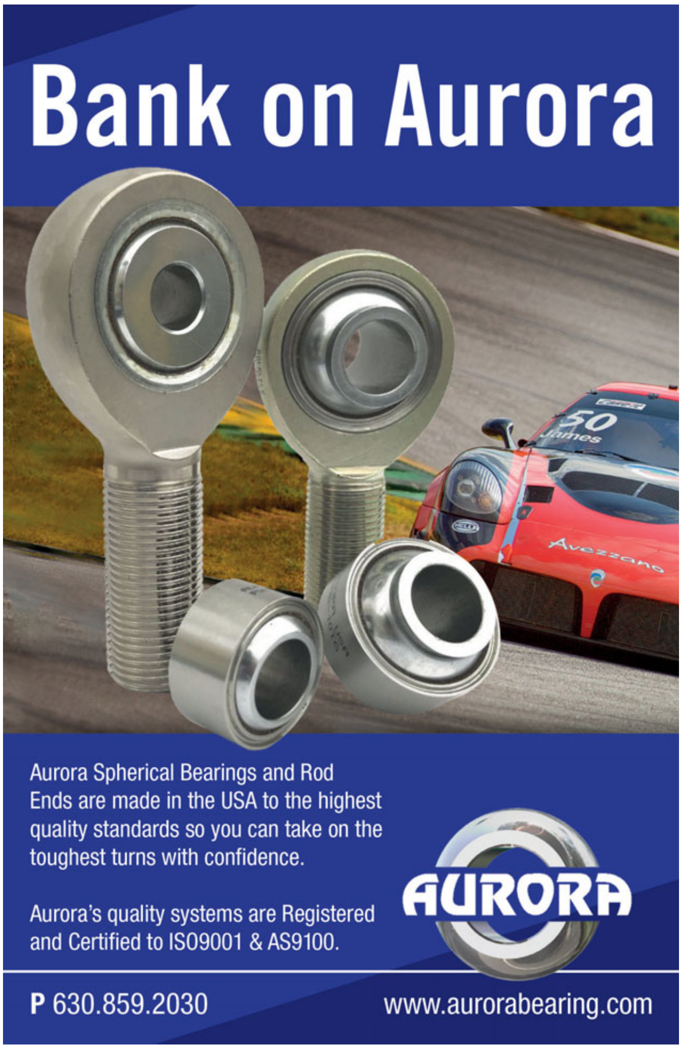

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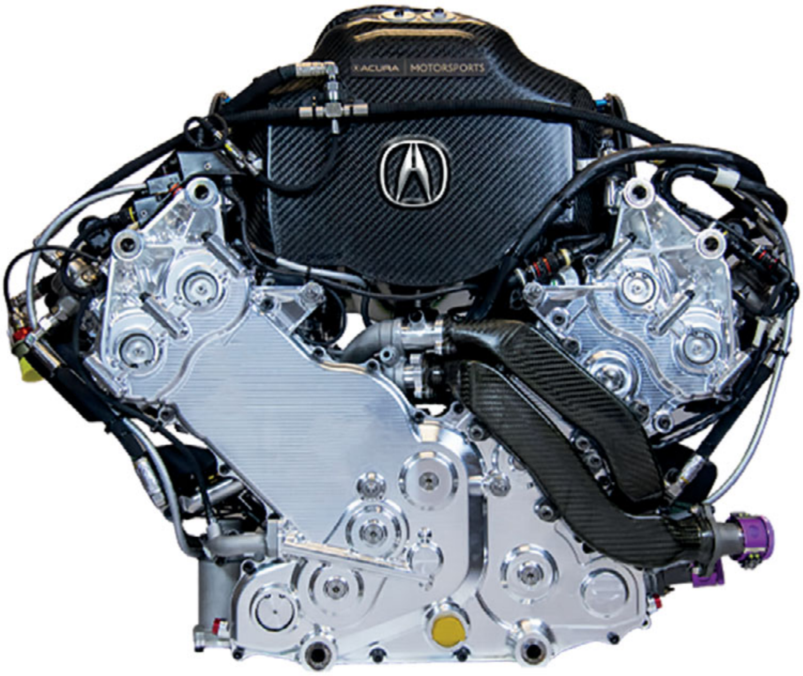


us, as well as the fans. We need to develop young, smart engineers. If you look at these LMDh cars that are coming through, they're very sophisticated. It's an LMP1 car basically, and the buzz in the factory right now is pretty awesome. It's really given our engineers something to get their teeth into. Almost too much at times, to be honest, but that's exactly why we all signed up to go racing. Importantly, they've managed to anticipate that and still keep costs under control."

There's certainly no shortage of technology on the new car. Top of the list is the rear-mounted hybrid system, which uses spec hardware provided by Bosch, Williams Advanced Engineering and Xtrac. There's an all-new 2.4-litre engine that shares its twin-turbo V6 configuration with the old unit, but very little else. Designed from scratch for the ARX-06, it's the smallest engine that HPD has ever fitted to an endurance racer, and it revs to a heady 10,000 rpm. Integrating the hybrid system into this new powertrain and managing its operation has been one of the biggest technical challenges in the development of the car.

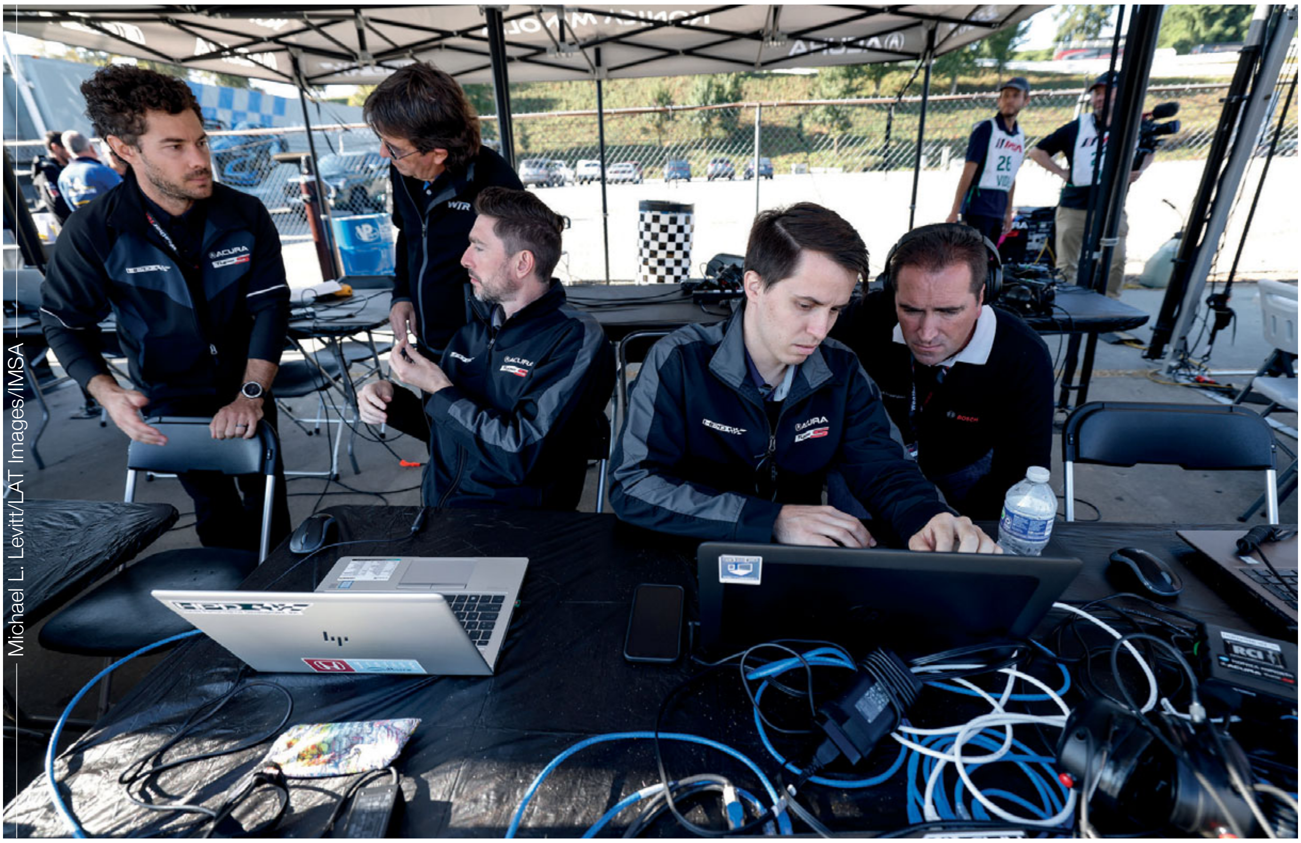
Software challenge

"It's no longer just an engine, it's a whole powertrain that all has to work together to provide the driver with what they're asking for," comments Yannacopoulos. "Whatever the MGU is doing, the brake-by-wire system has to balance it, and the engine has to react to it constantly through the corner. So there's a lot of software in between the various parts of the system, and you've got to write that from scratch. DPi was already a great platform for developing our own in-house software, and that's only grown with the arrival of LMDh."

The new carbon fibre tub is once again a collaboration with ORECA. Its fundamental design is still shared with the French firm's LMP2 offering, but it's said to have been designed for LMDh first and foremost. Beyond the basic structure, almost every part of the rolling chassis is Acura-specific, including new brake, suspension and steering hardware.

ABOVE An all-new 2.4-litre engine is the smallest HPD has ever fitted to an endurance racer

BELOW The sophistication of the new GTP category has created a buzz amongst HPD's engineers



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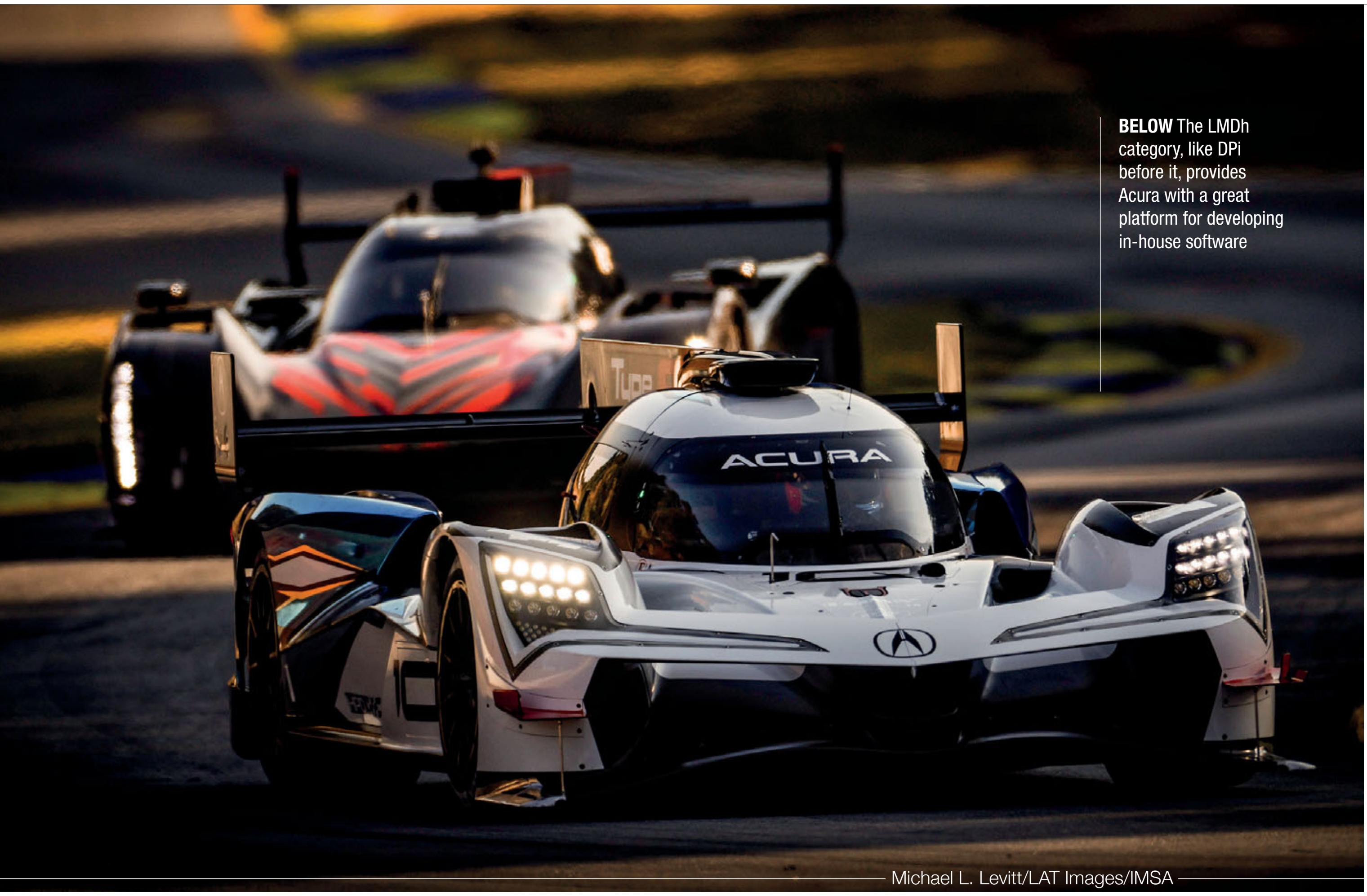


BELOW The LMDh category, like DPi before it, provides Acura with a great platform for developing in-house software

Michael L. Levitt/LAT Images/IMSA

> *“With DPi, IMSA proved to the world – and to the FIA and the WEC – that you can keep costs in check and still put on a good show”*

It’s clothed in an all-new aerodynamic package. Under the LMDh regulations, there’s slightly less downforce and the manufacturers now have to hit a somewhat tighter lift versus drag window. This has placed even greater emphasis on the use of CFD to ensure that the car meets the target values, but we’re told that the basic aerodynamic philosophy is close enough to apply a lot of lessons learned on the DPi. The cooling system, for instance, uses a similar radiator architecture.

But while the principles may be similar, it is fundamentally a clean sheet design, as Seaman points out: “A lot of the basics were already in place when we did the ARX-05, but here it’s all new. The underfloor is new (albeit part of a common spine), and the splitters and the rear wing are all ours.”

The LMDh aero targets have led to a very efficient car, but one that’s still said to have a high level of downforce compared to most racers. There’s now more freedom for manufacturers to incorporate their own styling features, providing they can meet the relatively narrow aero window. However, the challenges extend well beyond hitting the downforce and drag targets.

Narrow aero window

“It’s quite a challenge to really maximise the performance in this really small window,” comments Seaman. “That in itself makes our job a lot more challenging, but it gets harder when you also have to maintain an aero balance and provide enough adjustability within that so the team can set the car up.”

The ARX-06 was first previewed back in August, and testing is already well underway ahead of its debut at Daytona in January, with the focus very much on durability.

“Our main aim at the moment is to get miles on the car. It’s a brand new car, so we’ve got to find out what we don’t know,” comments Salters. “We need to get it to a point where the car can race flat out for an entire endurance event. And, as you can imagine with everything being new, we’ve got our work cut out.”

At present, Acura says it has no plans to compete in the WEC or at Le Mans. But it faces a formidable set of opponents at home in the IMSA championship with arch rivals Cadillac set to be joined by the might of Porsche and BMW (not to mention at least one team running a Gibson-engined LMP2 car).

Make no mistake, all four automotive giants will be out to win, promising even tougher competition than we’ve seen in recent years. And that’s before we talk about the additional manufacturers slated to arrive in 2024 or the possibility of LMH constructors such as Ferrari and Glickenhaus joining the party.

There’s no question that DPi was a success story for IMSA, but the forthcoming GTP format has the potential to go a step further, and perhaps establish itself as a new golden era of North American sportscar racing. RT

MOTORSPORT RISES TO THE OCCASION

Mark Skewis offers a sneak preview of some of the latest technology due to be showcased in the trade show season

FOLLOWING an enforced hiatus, due to the COVID pandemic, the success of the 2021 trade shows demonstrated the continued importance of being able to meet fellow industry professionals in person and exchange ideas.

This year's show season kicks-off with Professional MotorSport World Expo, which returns this November for three days, showcasing the latest and best technologies for motorsport and ultra-high-performance road car applications.

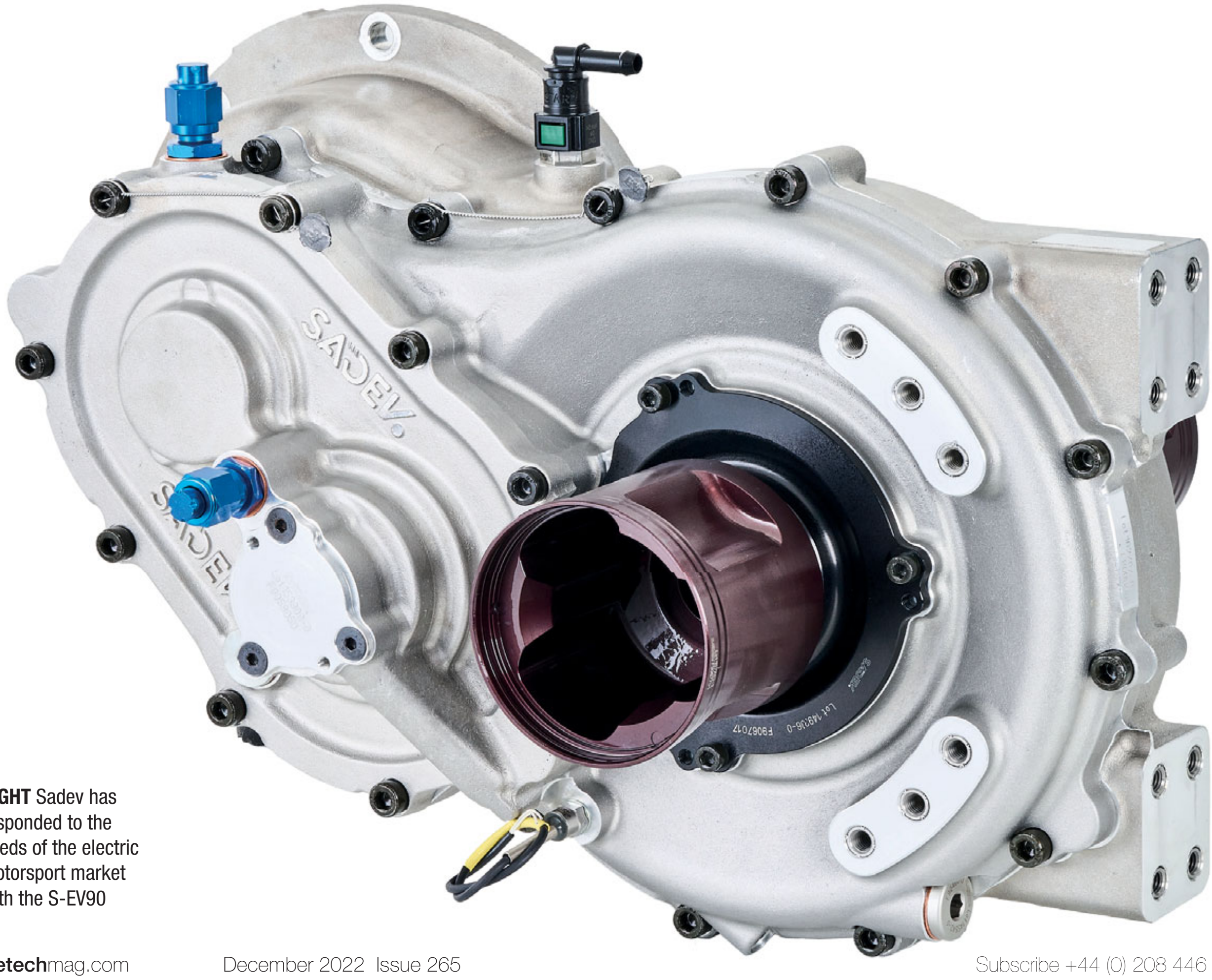
Companies are responding to the technological upheaval motorsport is experiencing, with sustainable powertrains seeing rapid adoption. Unthinkable just a few seasons ago, many of the advanced products showcased in the next few months will help shape the industry's direction.

EV transmission

Sadev

THE latest off-the-shelf transmission product from Sadev, S-EV90, has been made to answer the technological needs of the electric motorsport market. With a choice of gear ratios, self-locking differential, oil pump and various mounting plates, the EV specific S-EV90 reduction gearbox can be customized and fitted to many different setups.

In terms of EVs, the technological innovations made by Sadev for many years have convinced the big names of the motorsport industry, starting with the e-Trophée Andros in 2009, Formula E since 2015 and at the Pikes Peak International Hillclimb with Volkswagen's ID.R in 2018. Many of the most prestigious categories already involved in electrified motorsport have trusted Sadev transmissions, including Rally (WRC), Rallycross (RX2e, FC1-X), Single-Seater (Formula E), and Endurance (Hypercar). Sadev will showcase two products dedicated to electrified vehicles during PMW Expo 2022.



RIGHT Sadev has responded to the needs of the electric motorsport market with the S-EV90

LMDh steering system

Sportech Engineering

SPORTECH Engineering, exhibiting at PMW Expo, has been appointed by Multimatic as partner for the development of the steering system and supplier of the steering rack for the company's LMDh project.

The XSP135 hydraulic power steering rack developed for the Multimatic LMDh chassis is a 100% tailored product and thanks to the joint activity of Multimatic and Sportech engineering design departments, the demanding packaging and performance requirements have been achieved.

"We are thankful for the very valuable feedback we have got from the car test activity that allowed us to refine the hydraulic simulations and fine-tune the boost curve accordingly to the drivers' expectations," said Sportech. "We are proud to be involved in an LMDh project, the vanguard of technical developments in motorsport that are relevant to the reduction of the environmental impact of future mobility."

After the initial development phase, Sportech Engineering is now focused on supplying more units for ongoing car testing ready for LMDh's 2023 debut.

Sustainable fuel

ETS Racing Fuels

SUSTAINABLE fuels will increasingly feature during show season as motorsport adapts to its new role in fighting the climate crisis. One such pioneer is ETS Racing Fuels, which is showcasing its sustainable Renewablaze portfolio.

Its racing fuels are available with up to 100% sustainable components based on cellulosic feedstock, meeting regulations such as European gasoline standard EN228, as well as FIA and FIM rule and defined sustainability targets.

Renewablaze has been successfully proven on the Dakar Rally and in diverse GT racing and motorbike applications. The Super GT championship in Japan will run on the fuel from 2023 onwards, one of the first Asian championships to do so.

ETS
RACING FUELS
FORMULA WIN

ABOVE ETS will be showcasing its sustainable Renewablaze portfolio

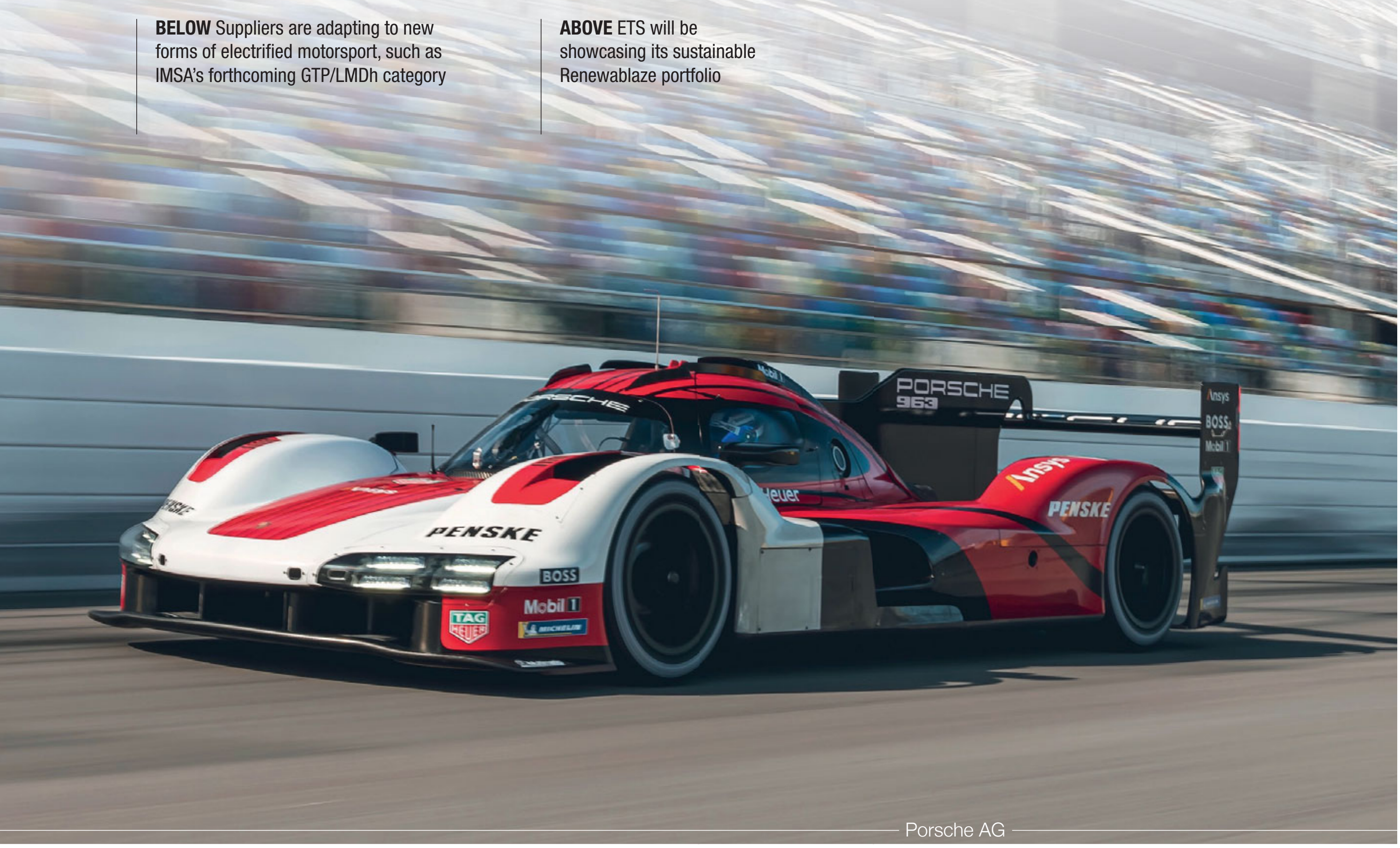
Sustainable fuel

VP Racing

VP RACING formulates more than 70 proprietary blends of technologically advanced race fuels. It consistently works with dealers, distributors and race series worldwide to meet market demands while staying on the cutting-edge of ever-changing fuel regulations.

In addition to the company's broad portfolio of tried-and-true racing fuels, VP designs innovative second-generation sustainable fuel blends such as its new N20 unleaded – developed as a 'drop-in' fuel in collaboration with the NASCAR Whelen Euro Series. It was the first such effort for VP in Europe.

N20 complies with the FIA Appendix J ▶



BELOW Suppliers are adapting to new forms of electrified motorsport, such as IMSA's forthcoming GTP/LMDh category

Porsche AG

and the EN228 European E10 road fuels regulations. It can be put into any modern European gasoline road car and used long-term without any issues. It requires no adjustments to the engine calibration and causes no fuel system compatibility issues for cars approved for E10 fuels.

Unlike first-generation renewable fuels that rely on direct food sources, VP formulates its second-generation fuels from agricultural waste. This feedstock does not compete with the food supply chain.

Tyre pressure monitoring system

Texys

THE Texys Group will exhibit its advanced tyre pressure monitoring system (TPMS), available in two versions to create different levels of data and performance to suit any requirement.

The TPMS-RS21 baseline sensor can measure pressure, internal temperature and relative humidity, and features a user-replaceable battery. For a budget TPMS sensor, the ability to measure relative humidity is a real step forward, and the replaceable battery also reduces unnecessary scrapping of wheel sensors after one or two race seasons.

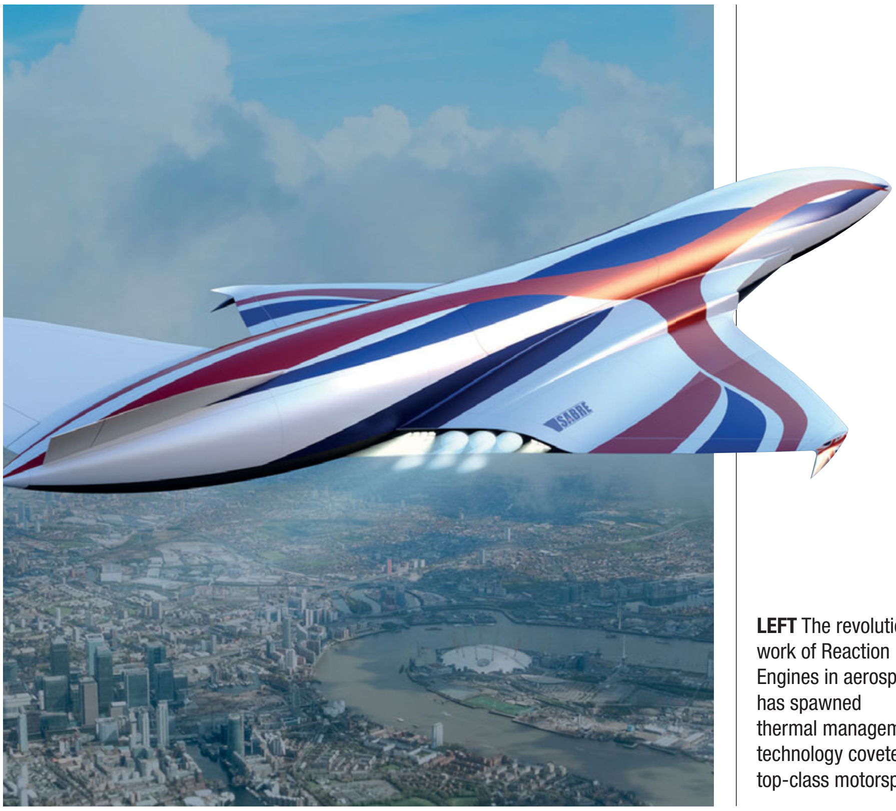
TPMS-IR21
U22071612
V1.06
V1.06

RIGHT Texys TPMS technology is advancing rapidly

The TPMS-IR21 flagship sensor boasts five key areas for tyre analysis: pressure; rim temperature via contact patch; internal temperature; relative humidity and innerliner temperature measurements. Carcass temperature is measured through a customizable infrared system, with five channels that can be selected from a 14-point calibrated array using the hand-held receiver.

The rim temperature feature provides a true rim temperature measurement via contact patch, unlike most available systems, which just provide the sensors' internal temperature. Furthermore, 2022 has seen the introduction of a new corner recognition system.

Texys TPMS technology is race-proven in FIA F2, F3, WRC, WEC, GT and many other series. From 2023 onward, the company will be the sole supplier of TPMS for Hankook Motorsport, the official tyre partner of the FIA Formula E World Championship.



LEFT The revolutionary work of Reaction Engines in aerospace has spawned thermal management technology coveted in top-class motorsport

Heat exchangers

Reaction Engines

REACTION Engines will return to PMW Expo to show off examples of its heat exchanger technology and battery foils.

The company has been at the forefront of engineering innovation for over 30 years, developing SABRE (Synergetic Air-Breathing Rocket Engine), a revolutionary new class of aerospace propulsion, which led to the development of its ground-breaking thermal management technologies that have revolutionized performance, efficiency and mass across a range of industries, including motorsport, electric vehicles, aviation and energy.

The company's high-performance heat exchangers, including multifluid radiators and water-cooled intercoolers, are available in cylindrical and conventional configurations. Based on next-generation microtube and micro-channel technology, they are smaller and lighter and operate with a lower pressure drop and reduced cooling air mass flow. This delivers improvements in performance and packaging while also reducing mass and drag, which translates into faster lap times and increased engine durability. Reaction Engines' technologies can be used to cool conventional internal combustion engine systems as well as electric vehicles, including battery, fuel cell and hybrid powertrains.

The company can also provide innovative heat management for EV batteries through application of its patented HXLIFE Foils, which are ultra-lightweight thermal transfer foils that sit between battery cells within the pack. They offer compact thermal runaway containment solutions, maintain isothermal performance and eliminate hot spots (cell temperature uniformity ±1°C). This enables increased protection and faster charge and discharge rates, and extends the life of the cells. ▶

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LEFT Years of development have gone into Nitron's electronic damper valve

Damper valves

Nitron

NITRON will showcase its new electronic damper valve, the result of several years of development and testing.

The valve is designed to be directly compatible with the vehicle's original damper control system, so the items can be fitted in place of the original dampers and no adjustment or alteration to the car is required. The valve will interact with the control program; however, if it is installed inside Nitron's own high-quality dampers, the vehicle can benefit from a sportier set of damping parameters. Combining the valve into multi-adjustable dampers also allows full integration into the vehicle's control system, but with the added benefit of on-the-spot manual fine-tuning (for example, at the circuit).

For vehicles requiring more in-depth tunability, Nitron offers a programmable controller that will replace the vehicle's original damper controller, allowing custom tuning of the control program. This unit can also be retrofitted to vehicles that were not originally fitted with electronically adjustable dampers.

As with all of Nitron's dampers, these units will be fully rebuildable and revalvable, allowing customers to fine-tune the dampers to their own requirements through traditional piston/shim tuning methods. All dampers will come with a five-year mechanical warranty.

Brake bias dial

Monit Motorsport

DRIVER confidence is key to extracting maximum performance from any race vehicle: optimization of brake bias, and vehicle balance during braking into corners, are areas where the new Monit brake bias dial will empower drivers of all ability levels to make performance gains.

The patent-pending Monit dial is a remote brake bias adjuster with a built-in LCD. It is a drop-in replacement for existing remote bias adjusters and works with all balance bars and pedal boxes. The Monit advantage is that drivers can reset the display to zero at their preferred position and then confidently adjust and optimize the vehicle brake balance for changing conditions, knowing that they can quickly and accurately return to their starting position if needed.

The clear, easy-to-read display stays on constantly, and the simple integer numbers are easy for the driver to quickly comprehend. In vehicles that have brake pressure sensors fitted, the additional benefit of the Monit dial is that the driver can see the bias position changes while driving, as opposed to pressure sensors that require the car to be stopped. The Monit brake bias dial allows drivers to make precise and accurate on-the-fly adjustments to maximize the vehicle's current braking system performance, ensure consistent corner entry balance and avoid any driver adjustment errors.

ABOVE The Monit in-car display

Available in two colours plus two mounting types and packaged complete with a flexible shaft, 7/16in and 3/8in balance bar fittings and accessories, the water-resistant Monit dial is battery-powered (so no wiring required) and has an 18-month battery life on a user-replaceable CR2032 coin cell battery.

Two independent driver 'zero' points can be stored to allow for accurate balance positions with driver changes. The 'zero' points can be shown relative to the front or rear bias depending on the driver's preference. Alternatively, 'absolute' position can be selected for alternative uses, such as suspension adjustment from the cockpit.

Gearbox actuators

MME Motorsport

MME Motorsport will show updated pneumatic actuators that are now even more powerful (1,005N at 8 bars), with an integrated gear control unit and position sensor, all in a lightweight, compact package.

Plug-and-play solutions are available for many gearboxes, ranging from Quaife to Porsche. They all feature MME's specially developed hypervelocity valve, which is the fastest (highest-flow) miniature valve in the world, according to the company. ▶

RIGHT MME Motorsport will show updated pneumatic actuators

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ABOVE A new range of Lithiumax Carbon Series lithium LiFePO4 engine starter batteries will be displayed

Engine starter batteries

Lithiumax Batteries

LITHIUMAX Batteries is showcasing its new range of Carbon Series lithium LiFePO4 engine starter batteries, including the Lithiumax RACE10+ Bluetooth and Lithiumax RACE+GT Bluetooth units.

These carbon fibre-cased batteries offer ultra-light weight and reliability with the added advantage of Bluetooth battery monitoring from the Lithiumax iOS or Android app, which allows the user to monitor voltage, real-time current draw, temperature (both core and skin), as well as remaining MAh capacity.

The RACE10+ at 4 kg delivers a substantial 1,000 CA with a lithium Ah capacity of 24 Ah (70 Ah Pb/AGM equivalent); the RACE+GT is a 3 kg battery outputting 800 CCA with 20 Ah lithium capacity (55 Ah Pb/AGM equivalent).

Lithiumax batteries are DEKRA tested and proven for motorsport use and approved by the DMSB and Motorsport UK.

Electronic interconnection expertise

Lane Motorsport

LANE Motorsport specializes in meeting the electronic interconnection demands of motorsport and can provide the latest high-performance connector technology from stock. In addition to connectors, the company offers a comprehensive selection of complementary lightweight connector accessories, all designed to meet the difficult environments found across motorsport, as well as specialist connector assembly tooling and high-performance adhesives and dispensers.

New products on display at PMW 2022 include an extension to the Souriau Eaton 8STA circular connector range, which now provides one of the smallest six-way motorsport connectors available worldwide. This space- and weight-saving connector family offers integrated back shell and colour coding options and the new 02-06 size complements the existing 02-35 and 02-05 layouts in offering six size 26 contacts.

Another highlight will include Lane's new Lemo M series of high-power connectors designed for the most stringent high-power distribution requirements. Seven different contact layouts have been introduced across five shell sizes utilizing the field-proven light and ultra-compact M series bodies combined with new gold-plated low-resistance high-power contacts. These new high-power variants of the popular Lemo M series can handle up to 430A in unipole and multipole options for high power distribution of electronic devices and electric drive vehicles in motorsport.

Cadmium- and chrome-free nuts

KL-Projects

THE ELV Directive states that vehicle and equipment manufacturers must avoid the use of hazardous substances such as lead, mercury, cadmium and hexavalent chromium in automotive products. With this in mind, KL-Projects will present its BlueFast range of hexagonal k-nuts and floating anchor nuts.

Traditionally, the k-nuts and anchor nuts used in motorsport and high-end sports cars originated from the aerospace industry, where cadmium plating is still very popular.

In the past 20 years, many studies on different plating methods have been carried out by the automotive and aerospace industries. Zinc-nickel plating is now seen as the preferred alternative to toxic cadmium plating and an improvement over traditional zinc plating. Zinc-nickel plating with trivalent chromium treatment has been selected as the environmentally friendly finish for the BlueFast range of hexagonal k-nuts and floating anchor nuts.

BlueFast k-nuts and anchor nuts (identified by the application of a blue dot) have been used in high-performance applications since the start of this year, and have been shown to not only meet the requirements of the ELV Directive but also provide designers with an environmentally friendly value-added fastener solution.

Three-crimp locking deformation is applied across the BlueFast range of hexagonal k-nuts to ensure consistent locking performance on many different types of bolts and studs. To achieve this and guarantee repeat performance, the locking torque is controlled and recorded for 15 cycles of each production batch. Technical drawings and 3D CAD models are available upon request to ensure fast integration into clients' designs. ▶

BELOW The BlueFast range of hexagonal k-nuts and floating anchor nuts

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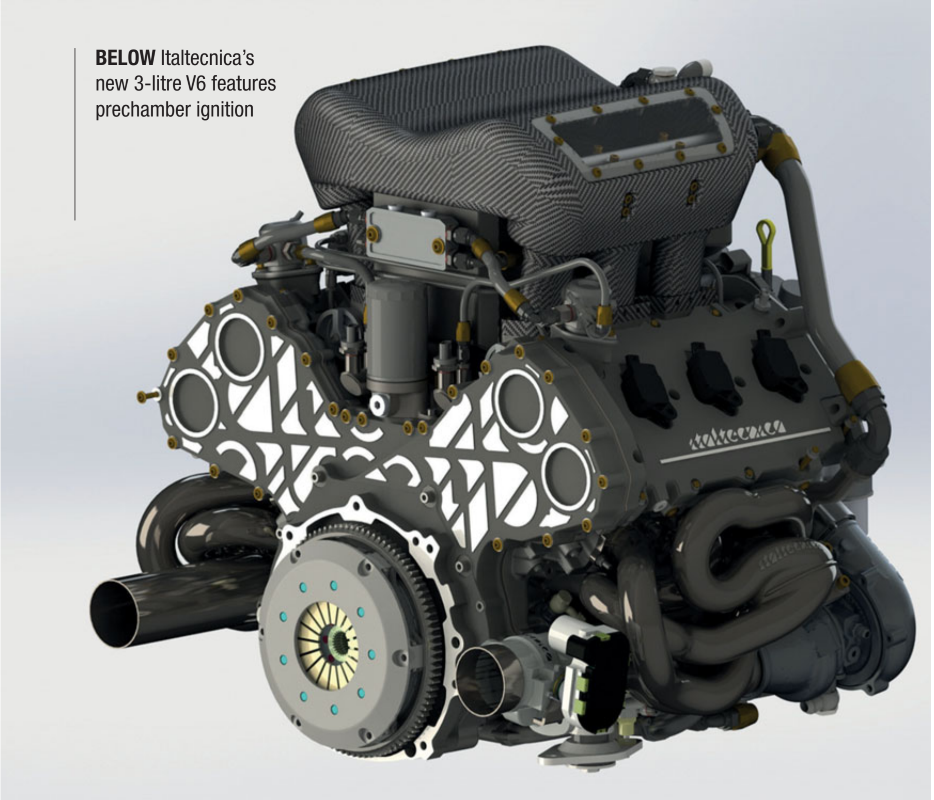

BELOW Italtecnica's new 3-litre V6 features prechamber ignition

Three-litre V6 engine

Italtecnica

ITALTECNICA, which can call upon 35 years in racing and high-performance powertrain development, will reveal a new top-class 3.0-litre 90° V6 engine in Cologne, featuring patented passive prechamber ignition and weighing less than 200 kg while delivering 850 Nm and 750 CV.

Its performance, compact size and reduced weight make it ideal for high-performance vehicles designed for road and racing applications. Ancillary components are integrated into the engine to ensure a ready-to-assemble system that does not require any hardware or software modifications.

The engine is boosted by two turbochargers working sequentially to reduce turbo lag: at low RPM, all exhaust gases are forced in one turbocharger; at high RPM, the two turbochargers work in parallel.

The cylinder head has been designed to increase volumetric efficiency and fit finger rocker arm valve actuation to reduce valvetrain mass and reach higher RPM. The intake system is equipped with six throttles actuated by two electronically managed electric motors. The fuel injection system is GDI and PFI to increase efficiency and performance.

The dry sump oil system is equipped with three scavenging pumps and one lubricating oil pump, with the oil cooler integrated into the engine. Intake air cooling is performed with a water-to-air heat exchanger in the intake plenum.

The combustion chamber is ignited by a passive prechamber patented by Italtecnica and Claudio Lombardi. The system increases overall efficiency by optimizing combustion, delivering more specific power and less consumption following the new F1 and LMP1 regulations. The whole engine is designed, tested and assembled by Italtecnica engineers and technicians. It is also available without ignition prechamber and in road and structural versions.

ECU technology

GEMS

GENERAL Engine Management Systems Ltd (GEMS) will present its new EM80-M – a small, light and reliable ECU for engines up to eight cylinders.

The EM80-M is a derivative of the EM80. It combines the existing engine management system with a powerful ARM processor setup to enable the use of auto-generated code from Simulink models. This allows users to design and implement their own complex control systems on a proven and rugged platform with the use of GEMS user interfaces and analysis packages.

At 157 x 131 x 35 mm, the EM80 is a compact package, weighing only 380g. As a member of ASAM, GEMS follows standards for CCP and XCP and can provide custom-built products for customers to any ASAM standards. GWv4 software provides PC configuration, with standards for XCP and A2L.

The EM80-M offers support files for auto code generation from Simulink models using Embedded Coder and generation of firmware images from Embedded Coder output. It is fully configurable with GWv4 software (supplied separately) and offers advanced gearshift control and high-speed internal datalogging.

It is suitable for naturally aspirated or boosted engines, with: adjustable fuel timing for engine speed and load, an anti-lag system with fuel and ignition cutting with ignition retard, closed-loop lambda, drive-by-wire throttle and turbo wastegate control, four-channel variable valve timing, uneven firing angles, multiple fuel ignition, VVC tables, up to eight calibration combinations for fuel, ALS, launch, etc, PMU CANbus 2 x CANbus, per cylinder knock control, internal barometer and G yaw sensor, scrutineer support and a 256 MB log memory with history log for engine maintenance.

Cordless pit-stop wheel gun

Dino Paoli

DINO PAOLI will introduce its new Typhoon Plus electric cordless pit-stop wheel gun, featuring a simple LED indicator system. This very robust, powerful and ergonomic wheel gun detects the torque that must be applied to the wheel nut during a pit-stop and switches on a green LED when this torque is reached, allowing the operator to work more quickly and safely.

The wheel gun shows a red LED while loosening the nuts, with the light flashing red at the start of the tightening operation before turning green when the torque is finally reached. The new gun also features built-in data storage that records all significant pit-stop data for post-race analysis, as required. ▶

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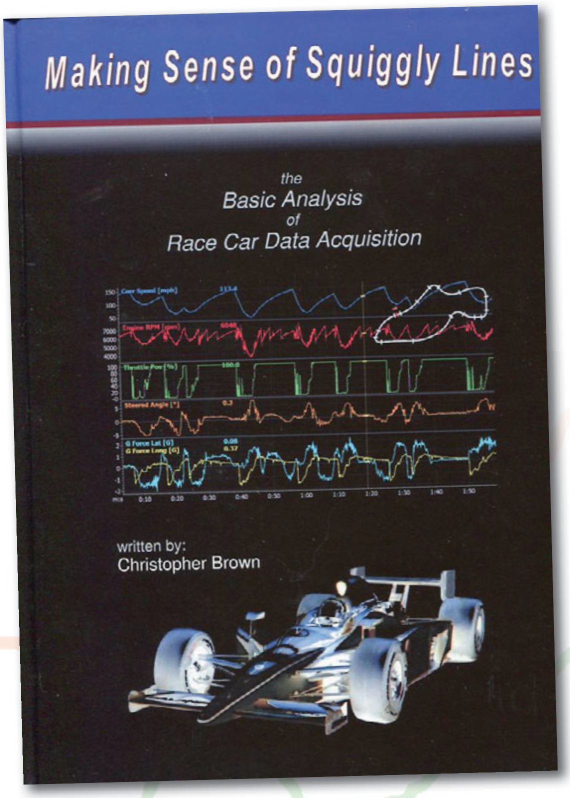
The Basic Analysis of Race Car Data Acquisition by ***Christopher Brown***



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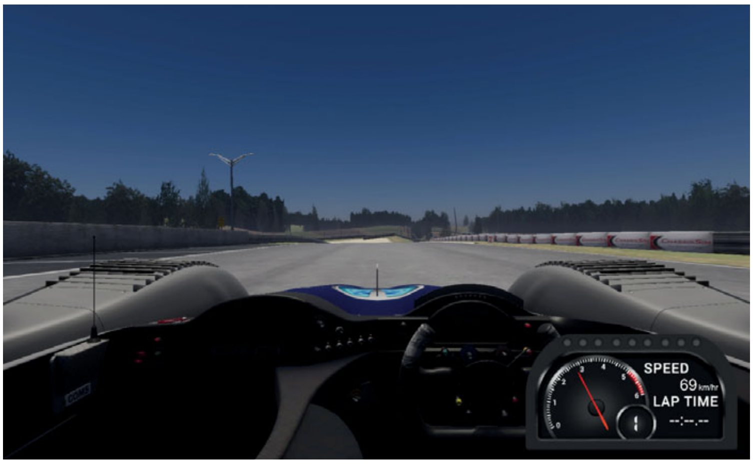


ABOVE ChassisSim driver-in-the-loop (DIL) toolbox v2 will be launched

DIL toolbox: Version 2

ChassisSim Technologies

CHASSISSIM Technologies will launch the ChassisSim driver-in-the-loop (DIL) toolbox v2 at PMW 2022.

ChassisSim DIL v2 builds on the firm foundations of the DIL v1 toolbox that is currently in use and getting results. The graphics and audio engine have been overhauled and improved, a new input engine has been added to deal with steering wheels that are not DirectX supported, and refinements based on customer feedback have been incorporated.

ChassisSim DIL allows users to utilize the same numerical engine as the other tools in the ChassisSim simulation suite, including lap time simulation, shaker rig and track replay simulation, ensuring the trends from these simulation tools are translated to driver-in-the-loop.

High-performance natural-fibre composites

Bcomp

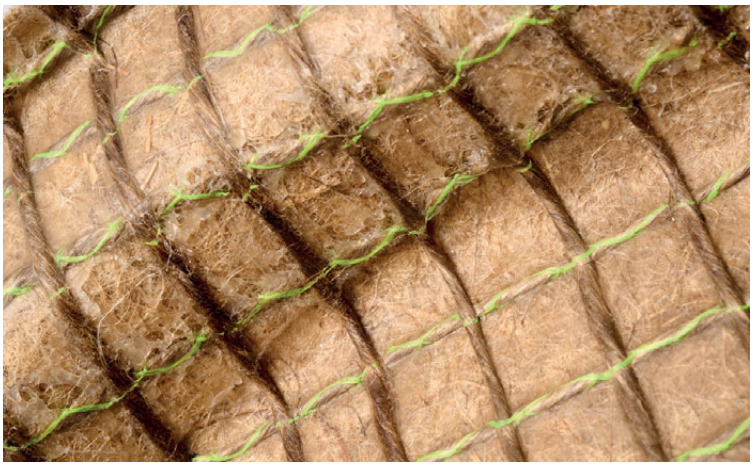
BCOMP will display its latest high-performance natural-fibre composites for motorsport. The company's ampliTex and powerRibs technologies feature in cars ranging from Porsche's 718 Cayman GT4 CS MR bodywork to McLaren's F1 seats, Mercedes-AMG GT4 bumpers and the latest BMW M4 GT4 car.

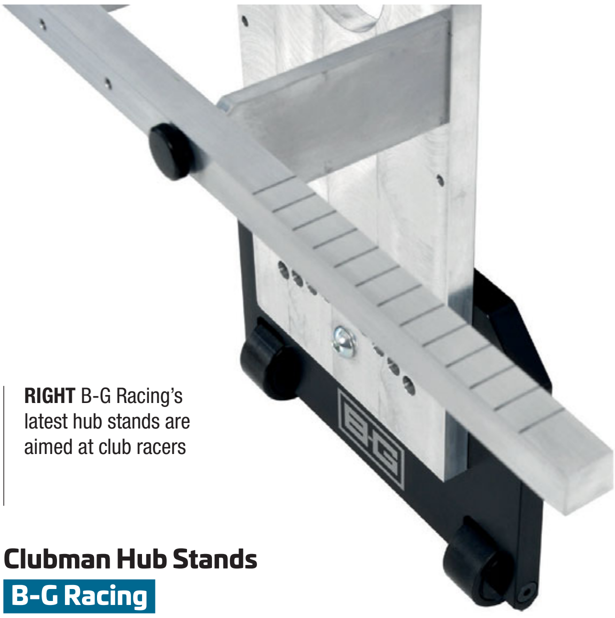
At the recent launch, BMW presented the serial GT car with the highest proportion of natural-fibre components to date. Much of the interior and exterior is made from ampliTex and powerRibs flax fibre composites; aside from the roof, there are almost no carbon-fibre-reinforced plastic (CFRP) components that were not replaced by the renewable high-performance flax materials.

Not only are the natural-fibre components superior in terms of sustainability – reducing the CO2 footprint by up to 85% cradle-to-gate and offering viable end-of-life solutions – but they also have performance advantages such as 250% higher vibration damping and much safer crash behaviour compared with carbon-fibre parts, due to blunt edges and the lack of sharp splintering.

BMW Group is now working hard to ensure that these new material technologies find their way into BMW M models and BMW M Performance parts. Further collaboration between BMW Group Research and Bcomp will focus on new sustainable material solutions for future production models as a key element of the group's sustainability strategy, which seeks to lower vehicle lifecycle carbon emissions by over 40% by 2030 compared with 2019 levels.

BELOW Bcomp's natural fibre parts are coming into their own with motorsport's sustainability push





RIGHT B-G Racing's latest hub stands are aimed at club racers

Clubman Hub Stands

B-G Racing

FOLLOWING the success of the B-G Racing Hub Stands kit launched in 2019, the company is now launching an alternative for racers on a smaller budget: Clubman Hub Stands.

Featuring the same design with multi-pattern PCD hub plates and height adjustability, the stands utilize a unique new design that can accommodate cars up to 1,400 kg. They are ideal for many grassroots racecars and are available at a reduced retail price, helping to make top-level equipment more affordable for the budget-conscious club racer. RT

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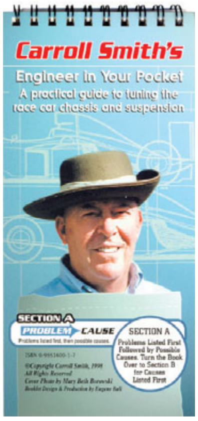
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IS AUDI BACKING THE WRONG HORSE?

Sergio Rinland knows what it's like to operate F1 teams in both Switzerland and the UK, so what does he make of Audi's decision to partner with Sauber for 2026?

THE official confirmation that Sauber will become the Audi F1 works team from 2026 carries me into uncomfortable territory.

It is great news for my old friends in Hinwil. This will be a much better deal than the current one of using customer Power Units from Ferrari, with Alfa Romeo branding. The big question here is: will the deal be as good for Audi as it is for Sauber?

Based on BMW's experience with Sauber, between 2006 and 2009, Audi will have to climb a high mountain. But I am sure that Sauber will be out to prove the doubters – me included – wrong.

When Sauber was a private team, before 2006, it managed to finish fourth in 2001. Yet with all the might, and Euros, of BMW behind it, and a team that was literally twice the size, it could only manage third in the championship in 2007 and 2008 (albeit, thanks to the disqualification of McLaren in 2007, it is listed as second).

Could it have won a championship if BMW had stayed put and continued expanding its efforts? We will never know. What we *do* know, is that the comparison with what Williams achieved as a private team just using BMW customer engines – second in 2002 and 2003, third in 2000 and 2001, a fourth and a fifth – shows that money alone in F1 does not guarantee success.

In 'modern' F1, from the early 1960s to these days, no team from outside the UK – with the exception of Ferrari – has achieved championship success. It is no coincidence that big brands like Mercedes, Renault, and Red Bull domicile their F1 teams in the UK. It is surely not because they like fish and chips!

In my days as a designer in F1, I worked for several teams in the UK and, because of that background, I have my stints at Dallara in the late '80s and, coincidentally, Sauber in the late '90s and early 2000s.

Being in those two environments gave me some idea of why motorsport, and more precisely F1, enjoys a centre of excellence in the UK. A lot has been written about 'Motorsport Valley' and its history of success, so I don't need to repeat it on these pages.

Hence, those experiences and knowledge are what make me doubt Audi's wisdom in partnering with Sauber to achieve Formula 1 success.

I know Formula 1 is a cosmopolitan industry but, to succeed in it, we come to England. So why did Audi go to Hinwil?

Based on its LMP experience of using Sauber facilities? I don't think that is enough. As much as we like Le Mans (I am a big fan!), we all know it is not at the same level as F1. Formula 1 is the pinnacle of the sport and not only in name.

Granted, there is no single 'Formula for Success' in F1. But if you are in the BoD of a big OEM, you need to look a bit further and question why your competitors went to the effort and expense of setting up their facilities in the UK.

We only need to study the most successful teams in modern F1 to discern a thread; sometimes not visible from the grandstand, but there is one. That is why mighty OEMs like BMW and Toyota came and went: not just because it was too expensive, for the lack of results had something to do with their withdrawal, and not being in the UK had something to do with that lack of results.

Nevertheless, I wish my old team in Hinwil and Audi the best of success come 2026 and beyond. I hope they *do* prove me wrong.

BELOW Sauber will swap customer engines and Alfa branding for works Power Units and the might of Audi

Sauber

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